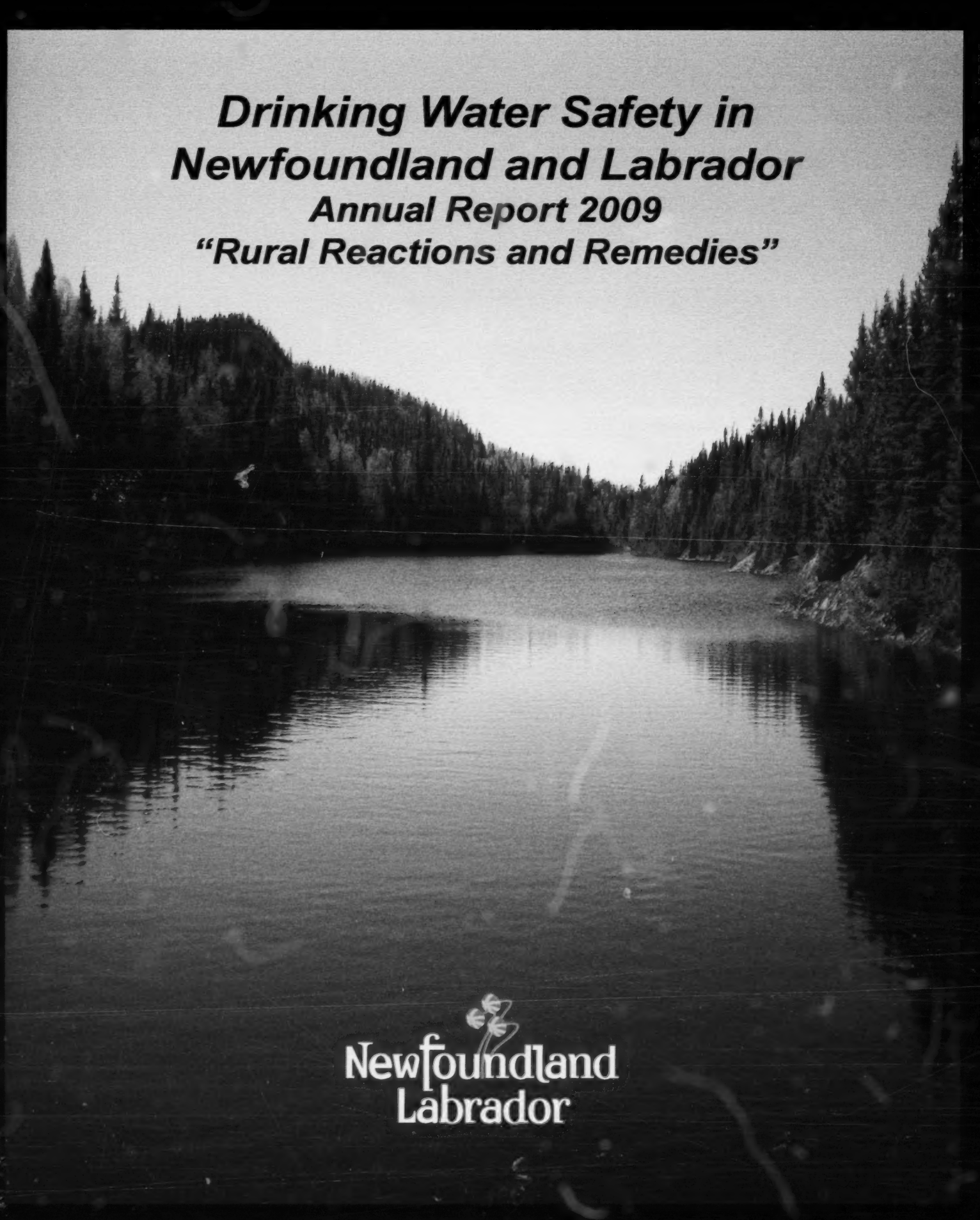

Drinking Water Safety in Newfoundland and Labrador

Annual Report 2009

"Rural Reactions and Remedies"

Newfoundland Labrador

Drinking Water Safety in Newfoundland and Labrador Annual Report 2009 "Rural Reactions and Remedies"

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Cover Photo: Protected Public Water Supply Area of Robert's Arm
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Message from the Minister

As the Minister for the Department of Environment and Conservation, I am pleased to present the annual Drinking Water Safety Report for 2009. This is the eighth such report produced by my Department which documents the activities undertaken by the province from April 1, 2008 to March 31, 2009 under the Multi-Barrier Strategic Action Plan for drinking water safety.

The report documents the status and progress made in the various aspects of the multi-barrier approach to protecting drinking water ranging from source water protection to monitoring to policy development. The report also features inserts that highlight points of interest about drinking water and showcase many of the diverse activities being carried out in this sector.

The theme of this year's report is "Rural Reactions and Remedies". Newfoundland and Labrador faces many challenges in striving to ensure clean and safe drinking water for the numerous smaller communities scattered throughout the province. In recognizing this particular challenge, I was pleased to announce the Rural Drinking Water Safety Initiative in May of 2008. Building on the principles of the Multi-Barrier Strategic Action Plan, the Rural Drinking Water Safety Initiative is based on a comprehensive evaluation of every public water supply in the province and outlines several options to improve drinking water safety in the province.

I would like to thank the staff of the Water Resources Management Division for their hard work and dedication to ensuring the safety of drinking water in the province. I would also like to acknowledge the commitment of front-line staff and management in the Departments of Government Services, Municipal Affairs, and Health and Community Services, as well as the province's regional Health Authorities, in the implementation of the Multi-Barrier Strategic Action Plan for drinking water safety. My thanks also extend to the Safe Drinking Water Technical Working Group for their invaluable coordination efforts on drinking water issues.

Lastly, I wish to recognize the vital role played by municipal governments in the provision of high quality drinking water to their citizens.

Charlene Johnson
Minister of Environment and Conservation

Executive Summary

This is the eighth annual report on drinking water safety in Newfoundland and Labrador, and covers the 2008–09 fiscal year (April 1, 2008, to March 31, 2009). It outlines the accomplishments and activities of the three-level Multi-Barrier Strategic Action Plan (MBSAP) which the Province uses to ensure drinking water safety. The theme of this report is "Rural Reactions and Remedies" which highlights the challenges and successes experienced by rural communities across the province.

The first section of this report focuses on Level 1 of the MBSAP. This level includes source protection, drinking water treatment, and drinking water distribution. Of the 531 public water supplies, 317 are water supplies with Protected Public Water Supply Area designation, five have active watershed management committees, 12 are equipped with water treatment plants (eight of which are conventional water treatment plants), and 435 have chlorine disinfection systems. In 2008–09, eight water treatment systems were upgraded with new chlorination equipment, and 47 communities applied for Potable Water Dispensing Unit (PWDU) funding.

The second section of this report focuses on Level 2 of the MBSAP. This level includes the monitoring of the province's drinking water quality through chemical, physical, and bacteriological sampling, inspection and enforcement, data management and reporting, operator education, training, and certification, and corrective measures. Some of the highlights achieved at this level in 2008–09 include: 4,323 chemical and physical water quality samples, 18,836 bacteriological water quality samples, 1,344 quarterly and annual Community Drinking Water Quality Reports, 213 permits dealing with water supply and sewer systems, and 103 permits regulating activity within Protected Water Supply Areas. In addition, 275 certified water and/or wastewater operators were at work in the province and 185 on-site operator training sessions were delivered.

The third section of this report focuses on the final level of the MBSAP. Level 3 deals with legislative and policy frameworks that govern all levels of the MBSAP, public involvement and awareness initiatives, water-quality guidelines, standards and objectives, and research and development. The highlights during 2008–09 that were achieved at this level include: implementation of a new policy directive dealing with drinking water quality monitoring and reporting, implementation of a new HAA guideline, six meetings of the Safe Drinking Water Technical Working Group, 14 presentations by staff on drinking water quality topics and issues, and several studies undertaken related to drinking water quality topics.

The report's final section provides Government's "Path Forward" for the 2009–10 fiscal year. The Government of Newfoundland and Labrador remains committed to ensuring the safety of the province's drinking water through action on all levels of the MBSAP. The Departments of Environment and Conservation, Government Services, Health and Community Services, and Municipal Affairs work collaboratively to achieve the goals of the MBSAP, and to enforce regulations and guidelines regarding drinking water safety. Each Department contributes uniquely to the safety of drinking water across the province. Continuing implementation of the Rural Drinking Water Safety Initiative for Newfoundland and Labrador will be a priority for 2009–10.

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Weblinks

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Water Resources Act SNL 2002 cW-4.01
www.assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

Weblink 2 - Page 4
Listing of Protected Water Supply and Wellhead Areas
www.env.gov.nl.ca/Env/Env/waterres/Policies/PWS_List.asp

Weblink 3 - Page 16
Standards for Bacteriological Quality of Drinking Water
www.env.gov.nl.ca/Env/Env/waterres/Policies/WQ-Standards-Microbiological.asp

Weblink 4 - Page 16, 21
Guidelines for Canadian Drinking Water Quality - Summary Table
www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/sum_guide-res_recom/index-eng.php

Weblink 5 - Page 19
Standards for Chemical and Physical Monitoring of Drinking Water
www.env.gov.nl.ca/Env/Env/waterres/Policies/WQ-Standard-PhysicalChemical.asp

Weblink 6 - Page 19
Drinking Water Quality Monitoring Manual: Physical and Chemical Parameters
www.env.gov.nl.ca/Env/Env/waterres/Surfacewater/DWQ%20Manual/DWQMonitoringManual.asp

Weblink 7 - Page 27, 40
Best Management Practices for the Control of Disinfection By-products in Drinking Water Systems in Newfoundland and Labrador
www.env.gov.nl.ca/Env/Env/waterres/CWWS/BMPs_for_DBPs/Report.asp

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Department of Environment and Conservation Drinking Water Quality Data
www.env.gov.nl.ca/Env/Env/waterres/Surfacewater/Drinking/DrinkingWater.asp

Weblink 9 - Page 30
Protected Water Supply Area List and GIS Layers
www.env.gov.nl.ca/Env/Env/waterres/GIS/PWS/PWSLayer.asp

Weblink 10 - Page 31
"What's New" (all the new information that has been posted by WRMD)
http://www.env.gov.nl.ca/Env/Env/waterres/WhatsNew.asp

Weblink 11 - Page 33, 40
Guidelines for the Design, Construction and Operation of Water and Sewerage Systems
http://www.env.gov.nl.ca/env/Env/waterres/CWWS/Guidelines_Water_Sewerage/Report.asp

Weblink 12 - Page 39
2009 Clean and Safe Drinking Water Workshop
www.env.gov.nl.ca/Env/Env/waterres/OETC/Operator/Workshop2009/Clean&Safe.asp

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WRMD Acts, Regulations. Policy Directives, and Water Quality Standards
www.env.gov.nl.ca/Env/Env/waterres/Policies/PolicyList.asp

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Department of Environment and Conservation Website
www.env.gov.nl.ca/Env

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Water Resources Management Division Reports and Publications
www.env.gov.nl.ca/Env/Env/waterres/Reports/Reports.asp

Overview

This is the eighth annual report that Newfoundland and Labrador's Department of Environment and Conservation has prepared to inform the public about how it is ensuring the safety of the province's drinking water. The report highlights Government initiatives, activities, and accomplishments made during the 2008–09 fiscal year (April 1, 2008, to March 31, 2009) and is a key part of the Department's ongoing efforts to keep the public informed about drinking water quality in the province. The theme of this year's report is "Rural Reactions and Remedies" and highlights the success of small communities in improving the quality of their drinking water.

The Government of Newfoundland and Labrador is committed to providing the public with clean and safe drinking water. To achieve this goal, it uses a Multi-Barrier Strategic Action Plan (MBSAP). Components of the MBSAP are listed in Table 1 and illustrated in Figure 1. Many authorities consider the MBSAP approach to be the most effective way to manage drinking water systems.

Table 1: Multi-Barrier Strategic Action Plan Components

Level 1 of the MBSAP	Source water protection
	Drinking water treatment
	Drinking water distribution
Level 2 of the MBSAP	Monitoring
	Data management and reporting
	Inspection and enforcement
	Operator education, training, and certification
	Corrective measures
Level 3 of the MBSAP	Legislative and policy frameworks
	Public involvement and awareness
	Guidelines, standards, and objectives
	Research and development

Four Departments are involved in Government's effort to ensure the safety of the province's drinking water: Environment and Conservation (acting as the lead agency), Health and Community Services, Government Services, and Municipal Affairs. Each department is responsible for one or more components of the MBSAP.

The first three sections of this report highlight accomplishments made in 2008-09 at each of the levels of the MBSAP. The fourth section summarizes Government's goals and plans for 2009-10 to further ensure drinking water safety.

Figure 1: The Multi-Barrier Strategic Action Plan

Participating Agencies

Agencies in four provincial government departments oversee the implementation of the MBSAP. In the figure above, their participation in specific tasks and responsibilities at each MBSAP level is denoted by the following colour coding:

- Department of Environment and Conservation
- Departments of Environment and Conservation / Health and Community Services / Government Services / Municipal Affairs / Federal Government
- Departments of Environment and Conservation / Government Services
- Departments of Environment and Conservation /Municipal Affairs

Level 1 of the MBSAP

The three components of the first level of the Multi-Barrier Strategic Action Plan are:

- source water protection
- drinking water treatment
- drinking water distribution system

This section outlines Government activities for each of these components during the 2008-09 fiscal year.

Source Water Protection

Drinking water sources can be surface water from rivers, brooks, lakes, ponds, and reservoirs or groundwater from dug and drilled wells. The protection of source water provides two important benefits. It helps safeguard public health and it reduces the challenges and costs of water treatment. On a cost basis alone, a single contamination event can be significantly more expensive to remedy than establishing a source protection program.

The province of Newfoundland and Labrador has one of the most widely adopted and well-established source water protection programs in the country. Government uses the *Water Resources Act SNL 2002 cW-4.01* to protect public drinking water sources. These areas are classified as either "Protected Public Water Supply Areas" in case of surface water supplies or "Protected Wellheads" in case of groundwater supplies.

Establishing protection is a cooperative process that is initiated by individual communities, as specified by the *Water Resources Act SNL 2002 cW-4.01* . The Department of Environment and Conservation continues to encourage all communities that have not already done so to initiate the protection process for their water supplies. Table 2 outlines the process for designating a Protected Public Water Supply or Protected Wellhead Area.

Following designation, a permitting process restricts high-risk activities inside the protected area and regulates all other activities that could impair water quality. The controlling agency is the Department of Environment and Conservation, Water Resources Management Division and it issues regulatory permits under Section 39 of the *Water Resources Act SNL 2002 cW-4.01* . The *Act* can be found online at Weblink 1.

Keels Protected Public Water Supply Area

Table 2: Protected Public Water Supply and Wellhead Area Designation Process

The Protected Public Water Supply Designation Process
1. A community submits an application for designation to the Department of Environment and Conservation
2. Water Resources Management Division staff gather information about land ownership, drainage patterns, natural boundaries of the watershed area, nearby land-use activities, and surrounding topography.
3. The watershed boundary is delineated and entered into the Department of Environment and Conservation's GIS database.
4. A map indicating the area to be designated as a Protected Public Water Supply Area is submitted to Government's Interdepartmental Land Use Committee (ILUC).
5. ILUC reviews the proposed Protected Public Water Supply Area to determine if any land-use conflicts exist and how to resolve them.
6. Government designates the water supply as a Protected Public Water Supply Area or Protected Wellhead
7. A legal description of the protected area's boundary is posted in the *Newfoundland and Labrador Gazette.*

Three water supplies in the province gained protected status during the fiscal year 2008–09:
- Cannings Cove (#1 Pleman Pitts Well)
- Cannings Cove (#2 Eugene Ellis Well)
- Cannings Cove (#3 Glenda Penney Well)

Two water supplies in the province had their protected designation repealed as they are no longer being used as drinking water supplies:
- Sandy Cove (Water Pond)
- Virgin Arm – Carter's Cove (Frog Martin Pond)

A listing of all Protected Public Water Supply and Wellhead Areas in the province is available on-line at Weblink 2.

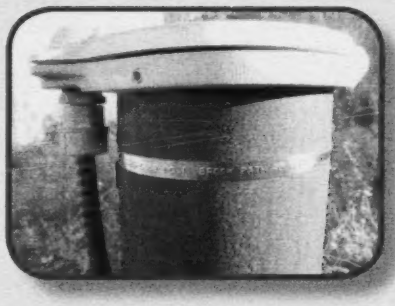
As shown in Figures 2a and 2b, the number of public water supply sources in the province totalled 502. Of these, 305 were surface water sources and 197 were groundwater sources.

Of these 502 sources, 317 are designated as Protected Public Water Supplies. More than 91 per cent of the people receiving water from public water supplies received it from a Protected Public Water Supply. The breakdown of public water supplies in the province is illustrated in Figure 3.

Identifying Public Wells and Pumphouse Infrastructure

Identifying public water wells, pumphouses, and sampling points is critical for accurate source water sampling. Proper identification of these locations ensures that water samples are always taken from the same source location.

Pumphouse signage



Well banding

Pumphouse Signage: Every groundwater public water supply in the province has a unique supply number and name displayed prominently on the outside of its pumphouse. Some pumphouses control multiple wells, which can cause uncertainty for anyone not familiar with the system. Consequently, source water sampling of wells is always done with the assistance of the local water supply operator who oversees the system.

Well Banding: All casings for public water supply wells in the province have now been identified with a stainless steel band and identification number. This undertaking was designed to clearly distinguish the public wells and reduce uncertainty where public and private wells exist in the same area.

During the 2008–09 fiscal year, the Department of Environment and Conservation installed exterior signage on 202 pumphouses, and banded 292 public well casings.

Figure 2a: Diversity of Public Water Supply Sources in Newfoundland: 2008-09

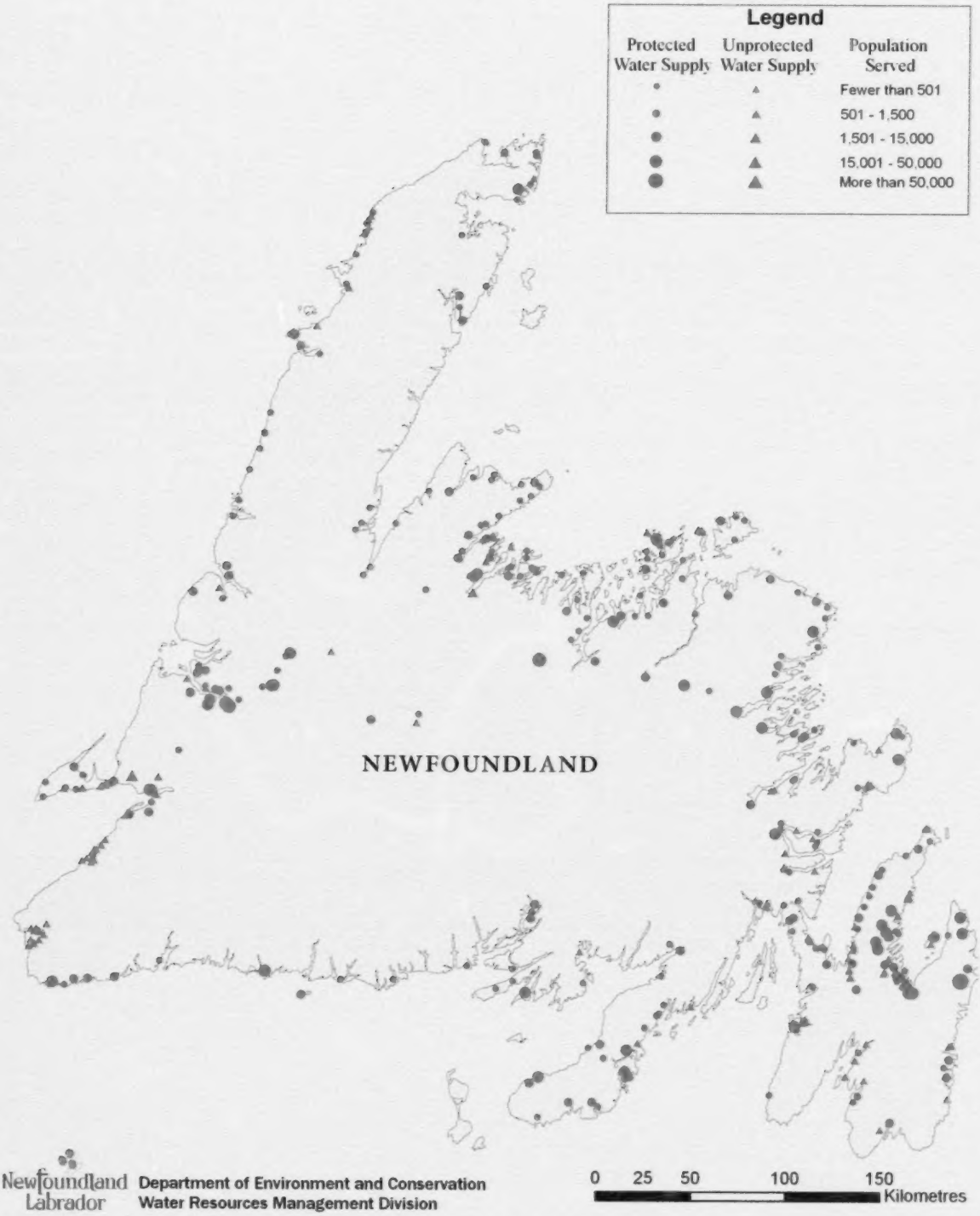


Figure 2b: Diversity of Public Water Supply Sources in Labrador: 2008-09

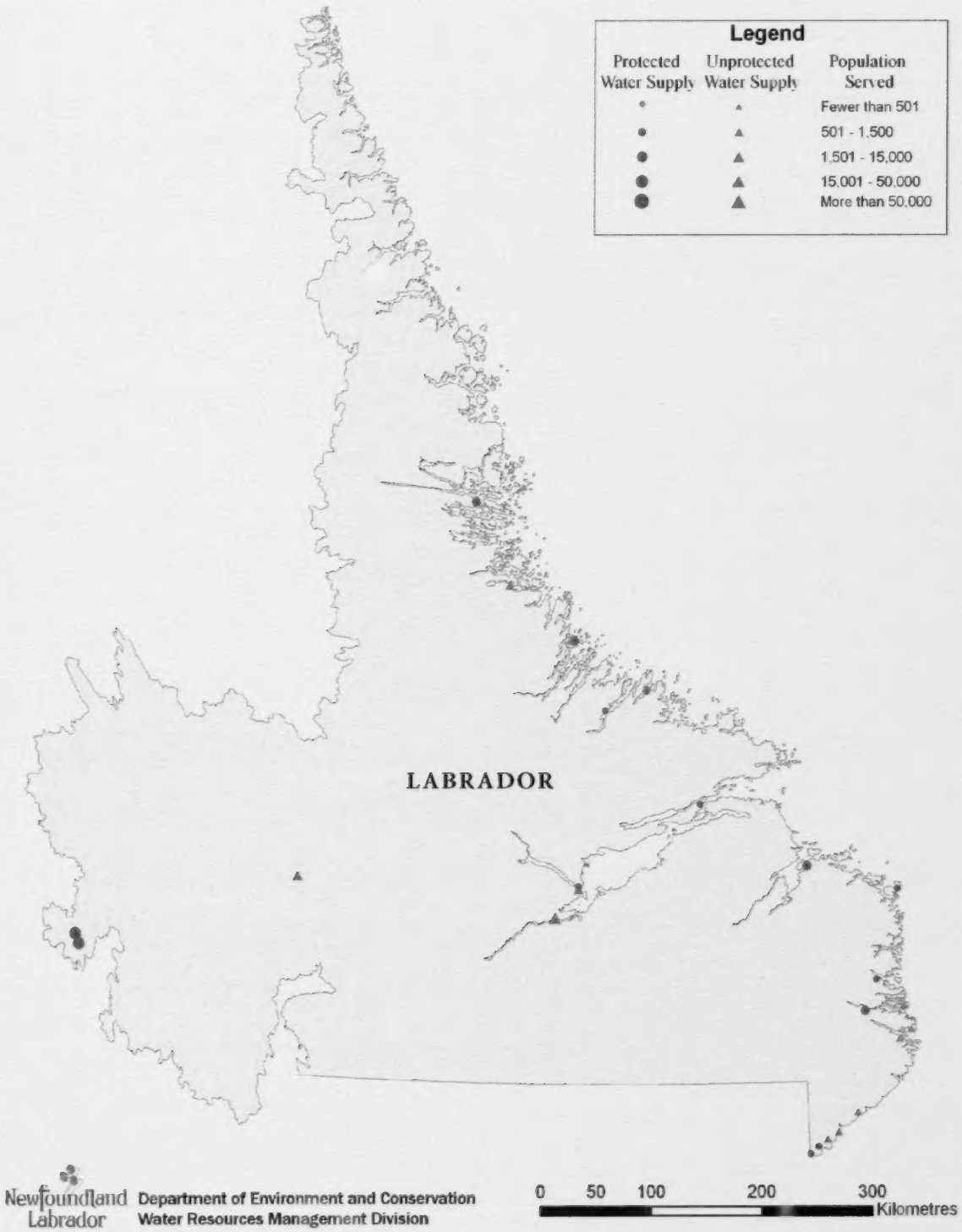
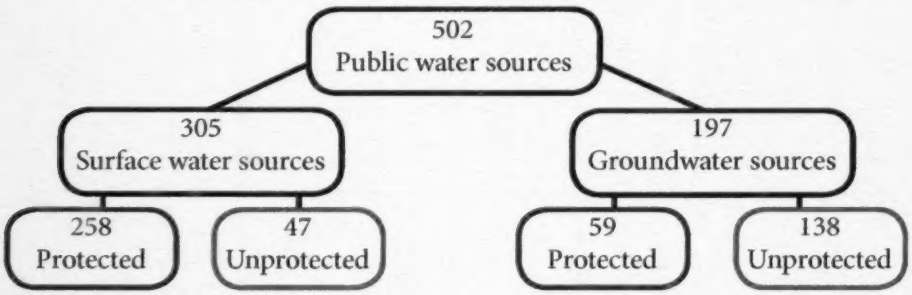


Figure 3: Public Water Sources in Newfoundland and Labrador: 2008-09



Watershed Management

Once a water supply is protected, a Watershed Management Committee can be formed to oversee land-use management and development issues and activities inside the protected watershed. Stakeholders on a committee typically include town council members, town residents, representatives from industry involved in development activities, Department of Environment and Conservation staff, members of environmental groups, and other concerned parties. The five Watershed Management Committees active in 2008-09 in the province are located in:

- Clarenville
- Steady Brook
- Corner Brook
- Gander
- Grand Falls - Windsor

Drinking Water Treatment

Drinking water treatment is the second component of the MBSAP process. Treatment refers to all the processes, techniques, and systems used to clean, disinfect, and protect water after it leaves the source and before it is distributed to consumers.

Disinfection

When used in drinking water treatment, chlorine in liquid, gas, or powdered form disinfects water and minimizes microbial growth in the distribution system. In the 2008–09 fiscal year, there were 435 chlorine disinfection systems in the province. Of these:

- 296 were liquid chlorine systems
- 130 were chlorine gas systems
- nine were chlorine powder systems

While chlorine is an effective disinfectant, it can also create disinfection by-products (DBPs) such as trihalomethanes (THMs) and haloacetic acids (HAAs) in the water distribution system. To ensure drinking water remains safe, it is essential that optimal levels of chorine are maintained throughout the system.

Chlorination is the most commonly used drinking water treatment method in the province, but there are also alternative methods utilized. In the 2008–09 fiscal year there were:

- 31 ultraviolet radiation (UV) systems
- four ozonation (O_3) systems in water treatment plants
- six mixed oxidants systems

Regional Water Supply for Grand Bank and Fortune

For many years the residents of the Grand Bank experienced poor drinking water quality. The town's water source was the nearby Grand Bank Brook with high colour and turbidity. The Town of Grand Bank had considered building a water treatment plant to deal with the problems, but was deterred by the related expenses: $3 million to build the plant plus annual operating costs.

The Department of Municipal Affairs suggested investigating the possibility of serving both Grand Bank and nearby Fortune from a single regional water supply. A consultant was hired, and the resulting study determined that the Fortune water supply was of much higher quality than Grand Bank's and could meet the water demands of both towns.

In 2008-09 Fortune's 250 millimeter water main was extended about five kilometres to the existing chlorination and pumping facility in Grand Bank. A pH adjustment system was added in Fortune to raise the pH of the water and help both communities deal with corrosion control in their water supply infrastructure. The water is re-chlorinated in Grand Bank, to ensure that it is bacteriologically safe.

Map of Grand Bank and Fortune

Ultraviolet radiation: Water passes through an ultraviolet irradiation chamber and the ultraviolet rays deactivate any pathogens in the water. UV disinfection is most effective in treating water with low turbidity and colour. This method leaves no residual disinfection but secondary disinfection with chlorine is still required.

Ozone: Ozone is generated on-site using oxygen and electricity. When this powerful oxidant is injected into the water, it deactivates pathogens. Using ozone as a disinfectant also removes colour, taste, and odour from drinking water. As with UV radiation, ozone treatment does not leave any residual disinfection and secondary disinfection with chlorine is required.

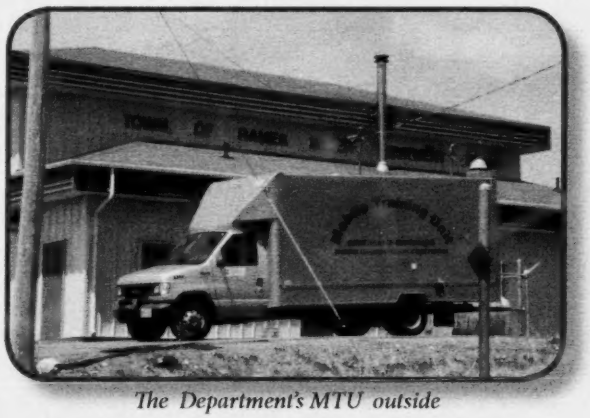
Mixed-oxidants: A mixed-oxidant solution is a mixture of chlorine and other chlor-oxygen compounds that are generated on-site electrolytically using salt, water, and power. The supplier states that mixed oxidants offer an elimination of biofilm, a more durable chlorine residual, reduced formation of disinfection by-products (DBPs), and improved taste and odor. There has been a number of mixed oxidants pilot systems in place in the province and the Department is still waiting on final reports before accepting this technology as a disinfectant alternative.

Water Treatment Plants

Thirteen water treatment plants are currently in operation in Newfoundland and Labrador. They use a range of treatment processes in addition to disinfection. Six of them are considered full-scale conventional water treatment plants which are designed to improve the quality of raw source water using coagulation, flocculation, sedimentation, and filtration.

In some locations, additional treatment is required because of site specific water quality problems. For example, infiltration galleries and filtration units are used when source water has high turbidity and when iron, manganese, or arsenic is present. Arsenic has been found in some of the province's water supplies. Many communities with arsenic values above the *Guidelines for Canadian Drinking Water Quality* have installed arsenic removal systems.

When a water treatment plant is deemed necessary, the Department of Environment and Conservation and the Department of Municipal Affairs assesses the water treatment needs of the affected communities. The municipality engages an engineering consultant to recommend an appropriate water treatment technology by first reviewing six technologies and then piloting three of them. The piloting phase includes a review of water quality data, the extent and nature of the water quality issues, the operation of a pilot plant for a set period of time, and of the economic viability of



The Department's MTU outside the Ramea Water Treatment Plant

various treatment options. Based on the results, a report is prepared and a recommendation is made about the type of water treatment plant required to address the community's water quality issues, as well as the funding required to implement it. Both Departments review the report and a final decision is made.

During the 2008–09 fiscal year, eight drinking water treatment systems in the province upgraded their chlorination equipment, and several systems evaluated, installed, or commissioned new water treatment processes. Grand Bank and Fortune, for example, each have a new pH system, a pilot mixed oxidants disinfection system has been introduced in Sunnyside, and the ozone system at the Bay Bulls Big Pond Water Treatment Plant in St. John's was upgraded.

Hands on Training Results in Improved pH in a Public Water Supply System

The Town operates a surface water system and treats the water with chlorine gas and controls the pH levels with soda ash.

During an on-site training session conducted by the Operator, Education, Training, and Certification Section (OETC) of the Department's Water Resources Management Division, the local operator asked for assistance with maintaining acceptable pH levels. Two issues were identified during the session's discussion and investigation:

1. The pH metering pump was set to run in manual mode. As a result, no signal was being transmitted from the flow meter to the pump, so the pump could not operate in "flow proportional" mode. Without a signal to guide it, the pump injected only a small amount of pH adjustment solution into the system.

2. A white residue buildup could be seen around components of the metering pump. This buildup could reduce the amount of solution being injected into the system resulting in a lower pH level than desired.

To address the first problem, the local operator decided to continue running the meter in manual mode for the time being, but altered the metering pump stroke length and frequency. This change increased the amount of solution injected into the system.

To address the second issue, disassembling and cleaning the main components of the metering pump was reviewed. The operator then shut off the town's metering pump and removed significant buildup that had formed around the components. The metering pump was re-assembled and put back into service.

Following these interventions, the pH levels of the town's drinking water have moved closer to the levels outlined in *Guidelines for Canadian Drinking Water Quality.*

Drinking Water Distribution System

The water distribution system is the final component in Level 1 of the MBSAP, and the largest piece of the physical infrastructure to ensure drinking water safety. It includes all the pipes, valves, service lines, pumping stations, fire hydrants, and storage facilities required to deliver clean and safe drinking water. In 2008–09, there were 531 public water distribution systems in the province's database. Of these, 29 systems obtained water from sources maintained by another community.

The Atlantic Canada Waterworks Voluntary Certification Board classifies water distribution systems according to the size of the population they service (Table 3). Most public water distribution systems in Newfoundland and Labrador fall into the "very small" classification as they serve populations of 500 people or less.

Table 3: Classification of Water Distribution Systems: 2008-09

System Classification	Population Size	Number of Systems
Unknown serviced population	Variable	43
Very small	500 or less	362
Small	501 to 1,500	82
Medium	1,501 to 15,000	41
Large	15,001 to 50,000	2
Very large	More than 50,000	1
Total Number of Systems		531

Very small systems face two major challenges:

1. Operation and maintenance: Successful ongoing operation and maintenance includes employing and retaining qualified and trained operators, which can be difficult in some rural areas with changing demographics.

2. Administration: Many communities with small systems serve small populations spread over a large geographical area, thus providing safe drinking water and maintaining the water supply systems are demanding tasks.

To address these challenges, Government continues to encourage the implementation of regional water systems and regional water operators wherever needed and feasible.

Regardless of the size of the system, ongoing infrastructure maintenance is required to ensure reliable hydraulic capacity and safe drinking water. Proper maintenance depends on operator knowledge and adherence to best management practices and operational procedures. The Department of Environment and Conservation addresses this requirement through it's Operator Education, Training, and Certification (OETC) program.

Proper maintenance prolongs the life of a water distribution system and reduces the frequency of leaks and breaks. Nevertheless, at some point repairs and replacements are necessary, and the financial cost can be substantial. In the 2008–09 fiscal year, the Department of Municipal Affairs' capital works programs directed approximately $16 million to fund 33 water infrastructure projects in the province.

On-site Training Saves Fire Hydrants

Fire hydrants contribute to a water distribution system in two important ways. They provide water for fighting fires and can also be used to flush the water distribution system.

One of the public water supply systems in a particular community has sixteen fire hydrants in its water distribution system. During an on-site OETC Hydrant Maintenance training session, it was discovered that two of the hydrants had been taken out of operation due to leaks. They were left out of service and had become non-functional. One hydrant could not be opened or closed due to a seized bearing and in the other, the bolt joining the upper and lower stems had sheared.

During the training session OETC staff used a cut-away fire hydrant in the Mobile Training Unit to demonstrate to the operator how to disassemble a fire hydrant. With this training, the operator was able to take apart the two broken hydrants and complete the necessary repairs. The hydrants were re-assembled, tested, and returned to full operation.

Hydrant under repair

Fire Hydrant Training for Fire Emergency Services

Early in 2008, the Fire Commissioner's Office asked the OETC section to participate in the province's new Fire and Emergency Services Training School. Specifically, the Fire Commissioner requested that the Section deliver a half-day session on hydrant operation and maintenance, recognizing that the OETC has delivered more than 200 such sessions to distribution system operators. The OETC saw this as an excellent opportunity to provide training to firefighters as they regularly operate hydrants.

The OETC section provided two half-day training sessions for the Fire Commissioners Office during the 2008–09 fiscal year. The first in Grand Falls–Windsor in May 2008 and the second in Marystown in October 2008. Each training session was well attended.

The Fire Commissioner has asked the OETC section to provide this training again in its next two upcoming sessions.

The hydrant session at the 2008 Fire and Emergency Services Training School in Grand Falls–Windsor (Photo Credit: Fire Chief Vince MacKenzie)

Level 1 of the MBSAP Highlights: 2008-09

- 531 public water supply systems are in operation in the province
- 317 public water supplies have Protected Public Water Supply Area designation
- five active watershed management committees exist
- 13 water treatment plants, six are full-scale conventional water treatment plants
- 435 chlorine disinfection systems are in use

Level 2 of the MBSAP

The five components of the second level of the Multi-Barrier Strategic Action Plan are:
- monitoring
- inspection and enforcement
- data management and reporting
- operator education, training, and certification
- corrective measures

This section outlines Government activities for each of these components during the 2008-09 fiscal year.

Monitoring

The Departments of Environment and Conservation and Government Services work together to monitor the drinking water quality of all public water supplies in Newfoundland and Labrador. Table 4 outlines the responsibilities of the two Departments.

Table 4: Departmental Water Quality Monitoring Responsibilities

Environment and Conservation	Government Services
Monitors source water (surface and groundwater) and tap water for chemical and physical parameters	Monitors tap water for bacteria and residual chlorine concentrations

Monitoring water quality involves collecting samples in a regular and consistent fashion so that they can be analyzed and compared to the *Guidelines for Canadian Drinking Water Quality*. In addition, the Department of Environment and Conservation's Water Resources Management Division also designs special monitoring programs to address site-specific characteristics and/or emerging water quality issues. Some communities also monitor specific water quality parameters themselves for operational purposes in water treatment plants or if a specific parameter is of local concern.

Long-term monitoring of drinking water quality has many benefits including the identification of trends and stability or changes in a community's water quality. Long-term monitoring allows Government to identify issues and determine if source protection needs to be reviewed or corrective measures introduced or revised.

Bacteriological Water Quality

The Department of Government Services is responsible for bacteriological sampling. As shown in Table 5, the frequency of this sampling is determined by the size of the population serviced by the water supply. The bacteriological parameters monitored includes total coliforms and Escherichia coli (E. coli).

Table 5: Bacteriological Water Quality Sampling Frequency

Population Serviced (number of people)	Sampling Frequency (per month)
No distribution system, PWDUs or very small system serving less than 100 people.	1 sample per month
Distribution systems serving:	
Less than 5,000 population	4 samples per month
5,000 to 90,000	1 sample per 1,000 population per month
More than 90,000	90 plus one sample per additional 10,000 population per month

Under the direction of the Department of Government Services, Environmental Health Officers collect samples from public drinking water supplies for analysis of bacteriological parameters. During the 2008–09 fiscal year, 18,836 bacteriological samples were collected from public drinking water supplies in the province.

Bacteriological Parameters: Analysis

The provincial Public Health Laboratory performs the sample analysis for bacteriological parameters. Samples are also tested at its affiliated regional testing locations. The Province compares the results to its own bacteriological standards as outlined in *Standards for Bacteriological Quality of Drinking Water*, which are based on the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*. The standards can be found online at Weblink 3 and the *GCDWQ* at Weblink 4.

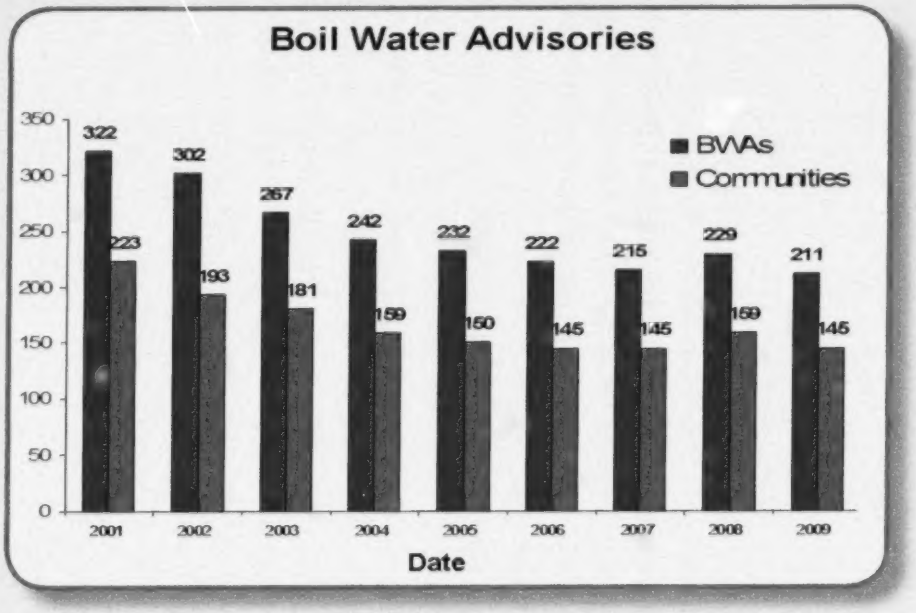
Boil Water Advisories: 2008–09

A Boil Water Advisory (BWA) is generally issued when there is reason to suspect possible pathogen contamination of a community's drinking water. BWAs are usually temporary and are necessary to protect the health of the people in the community. If a BWA is repeatedly issued for the same water supply, the community should correct the factors that are causing the problem.

At the end of the 2008–09 fiscal year, there were 211 BWAs in place in the province affecting 145 communities and 48,787 people.

Reasons for the 2008–09 BWAs (as of March 31, 2009) were:

- Residual chlorination problem (35.1%)
- No disinfection system (23.7%)
- System broken or no chlorine (14.7%)
- Operational problem in distribution system (11.4%)
- System is turned off by operator (10.4%)
- Microbiological (4.7%)



Bacteriological Parameters: Results

Of the bacteriological drinking water samples taken during 2008-09, approximately four per cent (820 samples) tested positive for the presence of total coliforms and less than one per cent (136 samples) tested positive for the presence of E. coli (Table 6).

Table 6: Overview of Bacteriological Sampling Activity and Test Results: 2008-09

Samples	Department of of Government Services Region					Totals
	Avalon	East	Central	West	Labrador	
Number of samples tested	6,749	1,557	4,586	3,537	2,407	18,836
Number of samples positive for total coliforms	146 (2.2%)	64 (4.1%)	252 (5.5%)	199 (5.6%)	159 (6.6%)	820 (4.4%)
Number of samples testing positive for E. coli	21 (0.3%)	7 (0.4%)	34 (0.7%)	37 (1.0%)	37 (1.5%)	136 (0.7%)

Total coliforms – 820 exceedances: Coliform bacteria are generally found in the feces of warm-blooded animals, but they can also survive in aquatic environments, soil, and vegetation. They are widely used as an indicator organism in water sampling because the analysis required to detect them is relatively simple and can be detected even in small amounts. If total coliforms are detected in concentrations greater than the *GCDWQ*, it can indicate that water treatment is inadequate or that bacteria are infiltrating or regrowing in the distribution system. The presence of coliform bacteria requires immediate investigation. There were almost ten percent more total coliform exceedances in 2008–09 than in the previous fiscal year.

Escherichia coli (E. coli) – 136 exceedances: E. coli is a bacterium that lives naturally in the lower intestines of humans and animals. The presence of E. coli in a water sample is a definite indicator of fecal contamination. If E. coli is present in a water sample, it means either that there was a deficiency in the water treatment process, or that post-treatment contamination occurred. This situation must be investigated immediately. There were three fewer E. coli exceedances in 2008–09 than in the previous fiscal year.

Chemical and Physical Water Quality

The Department of Environment and Conservation's Water Resources Management Division monitors drinking water quality samples for a number of chemical and physical parameters. They are classified as:

- inorganics (metals, nutrients, physical parameters, and major ions)
- disinfection by-products (trihalomethanes and haloacetic acids)
- emerging or special parameters (currently radionuclides, carbon tetrachloride, benzene, and bromate)

The Province's *Standards for Chemical and Physical Monitoring of Drinking Water* are available online at Weblink 5 and outline:

- the minimum number of drinking water quality parameters that the Department of Environment and Conservation monitor
- sampling frequency and locations at which samples are taken

To ensure that water quality data is reliable, the Division's staff follow a standard protocol when collecting samples. This protocol is outlined in the *Drinking Water Quality Monitoring Manual: Physical and Chemical Parameters*. The manual is updated regularly and is available online at Weblink 6.

The Department collects samples for disinfection by-products (DBPs) four times a year from surface water supplies that use chlorination as a disinfectant. Regular DBPs monitored are trihalomethanes (THMs) and haloacetic acids (HAAs). Guidelines for these parameters are based on locational annual running averages which is an average value obtained from four samples per year. These parameters typically do not form in groundwater because such sources typically contain minimal organic matter. Groundwater sampling for these parameters is generally only done for new public groundwater wells to gather baseline information.

For most inorganic and disinfection by-product testing, the Department analyzes historical sampling results before designing its annual drinking water quality sampling schedule. For tap water samples inorganic parameters are collected twice a year and DBPs four times a year. For source water, the Department normally collects two samples for a water supply every second year.

In the 2008–09 fiscal year, the Department of Environment and Conservation scheduled 4,291 samples, a 50 per cent increase over the 2,847 samples collected the previous fiscal year. The increase was largely due to new guidelines for HAAs. The samples scheduled for collection in 2008–09 included:

- 489 inorganic samples from source water
- 1,052 inorganic samples from tap water
- 1,166 trihalomethanes samples from tap water
- 1,584 haloacetic acids samples from tap water

Special Monitoring: 2008-09

Carbon Tetrachloride and Benzene:
These two compounds can be introduced into groundwater supplies when gasoline stored at service stations leaks into the surrounding soil.

In the summer of 2008, monitoring for carbon tetrachloride and benzene was conducted to determine the existence and/or extent of these compounds in the province's public drinking water supplies. Fourteen public groundwater supplies that are in the vicinity of a service station were selected for sampling. Results for all fourteen samples were below the *GCDWQ* for both compounds: 0.005 mg/L for carbon tetrachloride and 0.005 mg/L for benzene.

Communities monitored for carbon tetrachloride and benzene

Due to the low concentrations in the samples, regular monitoring for these parameters will not be conducted in the near future. Monitoring for carbon tetrachloride and benzene may be considered, however, on a site-specific basis for water supplies that could be affected by potential gasoline storage leakages.

Bromate:
This compound is a by-product that occurs when ozone is used as a disinfectant in drinking water. All water supplies treated with ozone pose a risk for bromate formation.

The Department of Environment and Conservation developed a special monitoring program to identify the existence and/or extent of bromate formation in Newfoundland and Labrador's public water supplies. Nine communities use ozone from four water treatment plants in the province. In 2008, all were monitored for bromate, and all nine were well below the *GCDWQ* standard of 0.01 mg/L.

Due to the low bromate levels, regular water quality monitoring for bromate will not be scheduled in the near future. However, water supplies treated with ozone will be monitored every four to five years to ensure that bromate levels remain below the *GCDWQ* guideline. In addition, monitoring for bromate will be considered for any new treatment plants that use ozone.

In 2008-09, there were 4,207 samples taken - 98% of all scheduled samples. The majority of missed samples were THMs and HAAs due to systems not being chlorinated. Table 7 shows a breakdown of the types of samples taken in this fiscal year.

Table 7: Overview of Chemical and Physical Sampling Activity: 2008-09

Parameter	Number of Source Samples			Number of Tap Samples		
	Surface	Ground	Total	Surface	Ground	Total
Inorganics	266	217	483	701	360	1,061
THMs	THMs result from chlorination and are not found in source water samples			1,087	43	1,130
HAAs	HAAs result from chlorination and are not found in source water samples			1,227	301	1,528
Special Samples	5	0	5	0	0	0

Note – Special Samples refer to samples not included in the Department's sampling schedule. In addition special parameter samples not included in the Department's standard sampling program include: 10 bromate samples, 4 hydrocarbon (2 source and 2 tap), 1 PAH, 1 oil and grease. Samples taken from groundwater supplies were tested as follows: 14 benzene, 14 carbon tetrachloride, 17 lead-210 and radium-226 (radiological), 58 gross alpha and beta (radiological).

Chemical and Physical Parameters: Analysis

In 2001, the Province of Newfoundland and Labrador adopted guidelines for chemical and physical parameters for safe drinking water. The guidelines are updated as necessary and outlined in the *GCDWQ* published by Health Canada. A summary of the guidelines can be found online at Weblink 4.

Following the collection of drinking water quality samples, the Department of Environment and Conservation submits the samples to an external accredited laboratory for analysis. The accredited designation ensures that the laboratory provides quality and competency in their sample analysis. The accredited laboratory is selected using a tendering process.

Chemical and Physical Parameters: Results

Results for the chemical and physical parameters are sent to the Department of Environment and Conservation when laboratory analysis is complete. The Department then evaluates the results by comparing them to guidelines as outlined in the *GCDWQ*.

The *GCDWQ* are classified as either an aesthetic objective for an aesthetic parameter or a maximum acceptable concentration for a contaminant. The results for aesthetic parameters and contaminants found during the 2008-09 fiscal year are discussed in the following sections.

Aesthetic Parameters

Aesthetic parameters pose no direct health or safety concerns but may reduce the consumer's opinion of the quality of their drinking water based on the taste, colour, and odour. Aesthetic parameters can also help determine the operational efficiency of a water system, and may highlight a need to make operational changes to the disinfection, treatment, or distribution systems.

During the fiscal year, several aesthetic parameters exceeded the aesthetic objectives as outlined in the *GCDWQ*. Aesthetic parameter exceedances included pH, chloride, colour, copper, iron, manganese, sodium, sulphate, and total dissolved solids (TDS) and are listed in Table 8. Colour and pH continue to be the most common type of aesthetic parameter exceedances.

Table 8: Aesthetic Parameter Exceedances: 2008-09

Note – pH levels do not have a unit measure and TCU refers to True Colour Units.

Aesthetic Parameter	*GCDWQ* Aesthetic Objective (AO)		Number of Exceedances (number of tap samples)
pH	6.5 to 8.5	≥ 6.5	283
		≤ 8.5	21
Chloride	≤ 250 mg/L		3
Colour	≤ 15 TCU		523
Copper	≤ 1.0 mg/L		5
Iron	≤ 0.3 mg/L		121
Manganese	≤ 0.05 mg/L		81
Sodium	≤ 200 mg/L		2
Sulfate	≤ 500 mg/L		4
TDS	≤ 500 mg/L		13

pH – 304 exceedances: The pH value measures the acidity of water. A low pH (higher acidity) accelerates the corrosion of pipes and fittings. A high pH causes scaling in the distribution system. Low pH levels are common in many areas of the province, mostly where the source water is in watersheds that have a large area comprised of bogs. Water in a bog environment typically has a pH value of between three and four (a value of seven on the pH scale is neutral—neither base nor acid). pH exceedances increased 25 per cent from the previous fiscal year.

Chloride – 3 exceedances: Sources of chloride in drinking water include salt used on highways to control ice and snow, effluents from chemical industries, oil-well operations, sewage, irrigation drainage, and landfill leachates. Natural causes include the dissolution of salt deposits, sea spray, and saltwater intrusion. Each of these sources can lead to local contamination of surface water and groundwater. There was one more chloride exceedance from the previous fiscal year.

Colour – 523 exceedances: Drinking water usually appears coloured because organic substances (such as organic debris or leaves) or metals (such as iron, manganese, or copper) are present. Additional factors that can affect colour include land-use activities and land-cover characteristics in the watershed. For example, drinking water supplies that are fed by water from bogs or peatlands may have a reddish-brown colour due to humic acids, tannins, and lignins carried in from the wetlands. Elevated levels of colour in source water can be more than an aesthetic concern because some substances that cause colour can contribute to the formation of disinfection by-products (trihalomethanes and haloacetic acids). There was a 35 per cent increase in colour exceedances from the previous fiscal year.

Copper – 5 exceedances: Copper found in drinking water samples is usually a result of corrosion in copper piping systems. Elevated levels of this metal can stain fixtures a blue-green colour, and may give water an adverse taste. The number of copper exceedances were the same as the previous year.

Iron – 121 exceedances: A naturally occurring element, iron is often found in water sources in the province. Elevated iron levels can also be caused by the dissolution of iron piping in the water distribution system. High iron levels can leave a brown stain on plumbing fixtures and other household items and adversely affect the taste of water. There were fewer iron exceedances than the previous year.

Manganese – 81 exceedances: Manganese is a naturally occurring element common in Newfoundland and Labrador's surface and groundwater. Elevated levels of manganese can stain plumbing fixtures and other household items and adversely affect the taste of drinking water. Manganese exceedances decreased by 20 per cent in the 2008–09 fiscal year.

Sodium – 2 exceedances: When sodium concentrations are above the aesthetic objective, the taste of the drinking water is generally considered offensive. Additionally, although sodium itself is not a toxic element (adults normally consume up to five grams per day). Small amounts can be a concern for people who, for health reasons, must follow a sodium-restricted diet. The number of sodium exceedances were the same as the previous year.

Sulphate – 4 exceedances: Sulphate is considered an aesthetic parameter because it affects taste. Discharged by industries that use sulphates and sulphuric acid, such as mining and smelting operations, sulphate makes its way into surface water mainly through atmospheric deposition. Sulphate in surface water often correlates with the sulphur dioxide levels in emissions from industrial or other human sources. Sulphate exceedances did not change from the last fiscal year.

Total Dissolved Solids (TDS) – 13 exceedances: TDS are mainly inorganic substances that dissolve in water. In addition to affecting the taste of drinking water, high TDS levels can make water excessively hard, which leads to mineral deposits and corrosion. There was one more TDS exceedance in the 2008–09 than in the previous year.

Contaminants

Contaminants are substances that are either known or suspected to cause adverse health effects when they are present in drinking water in amounts greater than the established maximum acceptable concentrations set by the *GCDWQ*.

The 2008–09 contaminant exceedances in tap water samples are outlined in Table 9. Exceedances were detected for arsenic, barium, bromodichloromethane (BDCM), haloacetic acids (HAAs), lead, trihalomethanes (THMs), and turbidity. Disinfection by-products (HAAs and THMs) are the most common contaminants in the province, and are mostly attributed to chlorination of waters high in organic carbon content. The nature of these contaminants are described in the following section.

Table 9: Contaminant Parameter Exceedances: 2008-09

Contaminant Parameter	*GCDWQ* Maximum Acceptable Concentration (MAC)	Number of Exceedances (number of tap samples)
Arsenic	0.01 mg/L	8
Barium	1 mg/L	2
BDCM	16 µg/L	50
HAAs	80 µg/L	144
Lead	0.01 mg/L	6
THMs	100 µg/L	128
Turbidity	1 NTU	63

Note – The guidelines for HAAs and THMs are based on locational annual running averages.

Arsenic – 8 exceedances: A natural element, arsenic is widely distributed in the Earth's crust. It can make its way naturally into groundwater through the erosion and weathering of soils, minerals, and ores. Because arsenic compounds are used to manufacture many products, arsenic can also enter drinking water sources directly as a result of industrial effluents, and indirectly through atmospheric deposition. There were five fewer arsenic exceedances in 2008–09 than in the previous fiscal year.

Barium – 2 exceedances: Barium is more often found in groundwater than surface water. A natural element, it is introduced to a water source through the erosion and weathering of soils, minerals, and ores. Both barium exceedances in the province during 2008–09 were in groundwater systems that had a history of elevated barium levels. There were no new locations where this contaminant was detected.

Bromodichloromethane (BDCM) – 50 exceedances: BDCM is one of the parameters that make up THMs in the *GCDWQ*. A separate guideline for BDCM was also deemed necessary by Health Canada. There were slightly more BDCM exceedances in 2008–09 than in the previous fiscal year. As this report was being prepared the guideline for BDCM was rescinded and is no longer listed in the *GCDWQ*.

Haloacetic acids (HAAs) – 144 exceedances: HAAs are disinfection by-products that form when chlorine is added to water containing elevated levels of natural organic matter such as decaying leaves and vegetation. High HAA levels are common for surface-based public water supplies in Newfoundland and Labrador because many of them contain high levels of natural organic matter and low pH. Formation of disinfection by-products continue to be an issue in the province and is being addressed through chlorine demand management and by exploring various corrective measures. Disinfection is an essential component of public drinking water treatment. The health risks from disinfection by-products, including HAAs, are much less than the risks from consuming water that has not been appropriately disinfected. The fiscal year 2008–09 was the first year that HAAs had a guideline value.

Lead – 6 exceedances: Corrosion of plumbing fixtures that contain lead such as pipes, solder, or service connections is usually the reason behind elevated levels of lead in drinking water. It can however be introduced from natural sources. Two of the exceedances in the province in 2008–09 were from one community with a history of lead exceedances. The four additional exceedances were from two communities, which did not have a history of lead exceedances.

Trihalomethanes (THMs) – 128 exceedances: THMs are disinfection by-products that form when chlorine is added to water that contains elevated levels of natural organic matter such as decaying leaves and vegetation. High THM levels are common for surface-based public water supplies in Newfoundland and Labrador because many of them contain high levels of natural organic matter. Formation of disinfection by-products continue to be an issue in the province and are being addressed through chlorine demand management and exploring various corrective measures. Disinfection is an essential component of public drinking water treatment. The health risks from disinfection by-products, including THMs, are much less than the risks from consuming water

that has not been appropriately disinfected. THM exceedances increased 15 per cent in 2008–09 over the previous fiscal year.

Turbidity – 63 exceedances: Turbidity is a measure of water's inability to transmit light or its "cloudiness". Turbidity in source water is usually caused by suspended solids, natural substances such as clay or silt, or micro-organisms. In tap water samples, turbidity can reflect either the characteristics of the source water or conditions in the distribution system. High turbidity alone is not considered harmful, but its presence can reduce the effectiveness of disinfection treatments. Elevated turbidity levels are common in surface-based public water supplies throughout the province. Improving source protection and introducing treatment alternatives can help reduce levels of turbidity. There were almost 35 per cent more turbidity exceedances in 2008–09 than in the previous fiscal year.

Tap water sampling in North West River

Disinfection By-Products: 2008-09

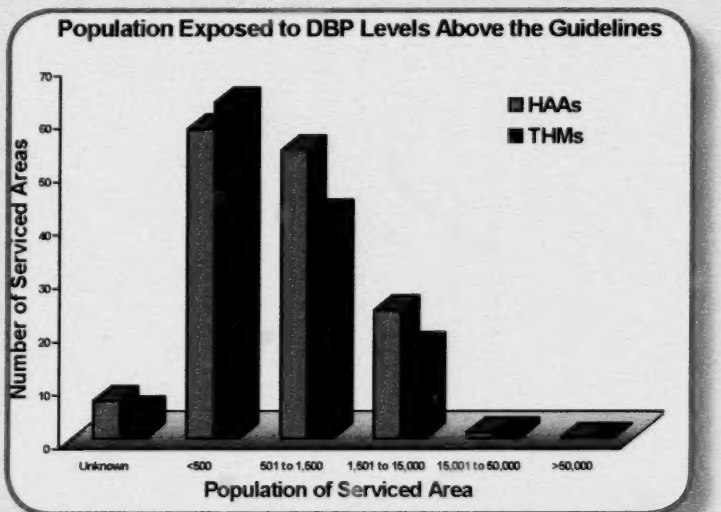
Disinfection by-products (DBPs) are caused when the chlorine disinfectant used to ensure drinking water safety reacts with naturally occurring matter in the water supply and forms new chemicals. In Newfoundland and Labrador, surface water supplies often have elevated levels of organic matter due to the decayed remains of leaves and branches. When this water is chlorinated, the organic matter reacts with the chlorine to produce DBPs. The majority of water supplies in the province come from surface water and use chlorination as a primary means of disinfection. Consequently, DBPs are a common concern in the province.

The Department of Environment and Conservation monitors drinking water for two DBPs: haloacetic acids (HAAs) and trihalomethanes (THMs). Maximum allowable concentrations (MACs) are set for both DBPs by Health Canada in the *GCDWQ* using locational annual running averages. The MACs for the disinfection by-products are:

- 80µg/L for haloacetic acids
- 100µg/L for trihalomethanes

Communities in the province are urged to make every effort to maintain concentrations of HAAs and THMs that are as low as reasonably achievable without compromising the effectiveness of disinfection. Best management practices that communities can use to control DBPs are outlined in Weblink 7 including chlorine demand management, retention time management, and source water treatment.

In the 2008–09 fiscal year, 144 serviced areas providing water to 161,249 people had HAA levels above the *GCDWQ*, and 128 serviced areas providing water to 131,064 people had THM levels above the *GCDWQ*.



Data Management and Reporting

Data Management

In the 2008–09 fiscal year, more than 4,000 drinking water quality samples were taken in the province. Each sample provides a unique set of results and are stored in the Department of Environment and Conservation's drinking water quality database.

This database is a critical component in the management and reporting of drinking water quality data. Not only does it contain the results of every drinking water sample taken in the province under the Department's Drinking Water Quality Monitoring Program, it also stores other necessary information used in program management. Managing the database allows the Department to do two important tasks: ensure compliance with the *GCDWQ*, and take appropriate measures to address emerging water quality issues.

Each season, the accredited laboratory analyzes the submitted drinking water quality samples and sends the results to the Department of Environment and Conservation. There the data undergoes a comprehensive Quality Assurance/Quality Control (QA/QC) procedure, which usually takes about six weeks to complete. The QA/QC procedure identifies and resolves issues in the data which ensures that the data is valid. The sample results are then released to the communities and the general public.

Each community sampled during the season is mailed its own specific and comprehensive quarterly and annual Drinking Water Quality Report. All drinking water quality data is also provided to the public online at Weblink 8.

Data management is an essential component of the Department's Drinking Water Quality Program and is constantly evolving to meet the needs of related programs. The Water Resources Management Division (WRMD) continues to focus on using its enterprise-level database and web service technology to allow the most accurate and current data to be shared.

In 2008–09, data management activities were conducted on several fronts. These initiatives involved distinct applications, but all had the same objective to improve the Department's ability to manage its Drinking Water Quality Program. During this fiscal year, new drinking water quality guidelines were integrated into the Department's data management systems. As well, improvements were made to internal applications to increase the information analysis and decision-making capacity of Departmental staff. Other initiatives focused on expanding the WRMD's ability to provide interested stakeholders outside of Government with access to its drinking water data.

Health Canada released a new guideline for HAAs in 2008. WRMD completed work to incorporate this new guideline into its data management and reporting systems during this fiscal year. It developed functions to calculate HAA averages, write them to the database, and flag the HAA guideline in WRMD's reports and applications. It also integrated the HAA guideline into the Drinking Water Quality Index.

The Drinking Water Quality (DWQ) Search Engine is a web-based application used by WRMD staff to review and analyze drinking water quality data. During the 2008–09 fiscal year, this application was redesigned to take advantage of new technologies and to incorporate evolving protocols in the drinking water quality monitoring program. Some of the new enhancements include:

- an improved user interface
- the ability to view and export all of a community's drinking water quality data
- the addition of two data sets for THM average and HAA average
- several improvements for flagging exceedances, including: BDCM exceedances, THM locational annual running average exceedances, HAA locational annual running average exceedances, as well as the use of date-based guidelines
- enhanced database security
- detailed summary pages for season, fiscal year, or water quality parameter, as well as an enhanced community summary page
- the ability to view related samples

The Department deployed a drinking water quality GIS application for internal staff use in 2004. This application allows staff to analyze water quality records and incorporate the spatial components of water supplies and their watersheds. In 2007–08 the federal government's GeoConnections program provided funds so that the Department could make this application accessible to the public. During this fiscal year, the application was updated to use the latest GIS server technology and work continues in conjunction with the Office of the Chief Information Officer to make this new Water Resources Portal available to the general public.

The new application makes use of web services that are compatible with the Canadian Geospatial Data Infrastructure, which allows them to be used by other web applications. The Water Resources Portal will provide members of the general public with capability similar to that of internal staff. The public will be able to view both spatial and non-spatial drinking water quality data. For example, they will be able to:

- view and create maps of public water supplies
- view reports on drinking water quality for selected communities
- submit queries in the drinking water quality database
- perform spatial analysis on a Public Water Supply and other related water resources data

A comprehensive database was created in 2002 to make sharing water supply and water quality information easier between government departments. Referred to as the Municipal Information Management System (MIMS), and managed by the Department of Municipal Affairs, the database holds basic information about the province's municipalities, such as their waste management facilities, capital works, financial details, municipal profiles, and water supplies. MIMS continues to be enhanced when needed improvements are identified.

Data management services are essential when a public water supply is being designated as a Protected Public Water Supply. Data management staff prepare much of the documentation that is required for the Interdepartmental Land Use Committee (ILUC) review. After designation, the

public can view the Protected Public Water Supplies in Google Earth using stand-alone shape files created by the data management staff and posted at Weblink 9.

Reporting

Since 2001, the Department of Environment and Conservation has been issuing Drinking Water Quality Reports to all communities with public water supplies. Communities receive a quarterly Drinking Water Quality Report for each relevant reporting season, and an annual report for the calendar year.

Depending on the type of sampling performed, these reports can contain results for samples collected at the source (for chemical and physical parameters) or at the tap (for chemical and physical parameters, THMs, and HAAs). They compare sample results to the *GCDWQ* and note exceedances. Two summary indices are also included: Water Quality Index (WQI) and Langelier Index. Both indices are designed to help simplify the interpretation of the analytical results. In the 2008–09 fiscal year, the Department issued 1,344 Drinking Water Quality Reports. Table 9 summarizes the reports that were issued.

A second key reporting function is the contaminant exceedance reporting protocol, which the Department introduced in 2001. This protocol is activated when sample analysis indicates the presence of a contaminant in a concentration that is above the maximum acceptable concentration listed in the *GCDWQ*. The reporting protocol continues to be successful in ensuring prompt communication with communities and appropriate government departments.

Under the contaminant exceedance protocol, the laboratory performing the drinking water quality sample analysis is required to notify the Department as soon as it detects any contaminant exceedances. The Department sends the laboratory an immediate confirmation of receipt and initiates site analysis to determine if the contaminant exceedance requires a resample. Following the site analysis, an Exceedance Report is issued to the community explaining the exceedance and whether or not a resample is required. This report is copied to members of the Departments of Government Services, Municipal Affairs, and Health and Community Services.

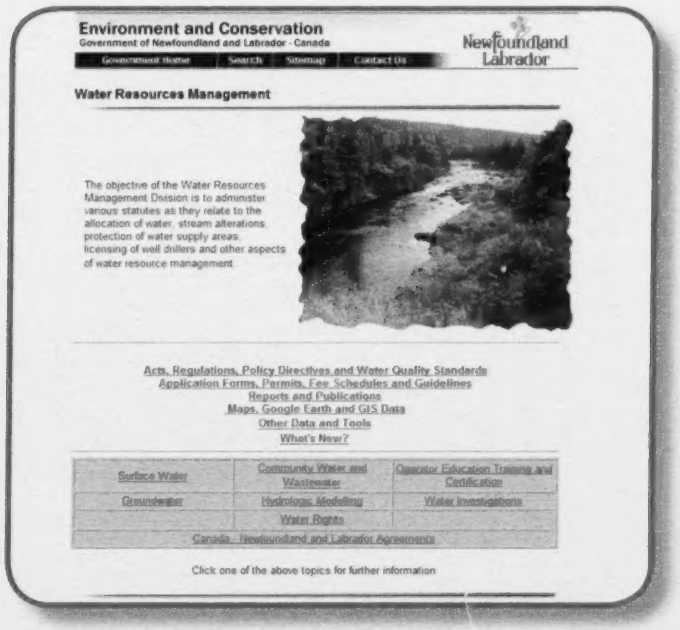
In the 2008–09 fiscal year, the contaminant exceedance reporting protocol was used to issue 71 Exceedance Reports. In some cases a single sample had more than one contaminant exceedance and only one Exceedance Report was prepared. Of the 71 Exceedance Reports, 51 were issued for bromodichloromethane (BDCM). Table 10 summarizes the Exceedance Reports issued each season during the fiscal year. The guideline for BDCM was removed from the *GCDWQ* in April 2009.

Due to the fact that trihalomethanes (THMs) and haloacetic acids (HAAs) are based on locational running annual averages, the exceedance reporting protocol does not apply. Exceedances for these two parameters are reported in the Drinking Water Quality Reports.

Table 10: Reports Issued by the Department of Environment and Conservation: 2008-09

Reporting Period	Drinking Water Quality Reports	Contaminant Exceedance Reports
Spring 2008	324 quarterly reports	10 exceedance reports
Summer 2008	329 quarterly reports	29 exceedance reports
Fall 2008	370 annual reports	21 exceedance reports
Winter 2009	321 quarterly reports	11 exceedance reports

The Water Resources Management Division's website is an important tool for communicating with the public. It is updated regularly with new information on drinking water quality and related topics. The "What's New" screen, which lists information recently posted online is located at Weblink 10. Table 11 lists the information that was posted during the 2008–09 fiscal year.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Water Resources Management
The objective of the Water Resources Management Division is to administer various statutes as they relate to the allocation of water, stream alterations, protection of water supply areas, licensing of well drillers and other aspects of water resource management.
Acts, Regulations, Policy Directives and Water Quality Standards
Application Forms, Permits, Fee Schedules and Guidelines
Reports and Publications
Maps, Google Earth and GIS Data
Other Data and Tools
What's New?
Surface Water
Community Water and Wastewater
Operator Education Training and Certification
Groundwater
Hydrologic Modelling
Water Investigations
Water Rights
Canada - Newfoundland and Labrador Agreements
Click one of the above topics for further information

Water Resources Management Division webpage

Table 11: Updates to the Department of Environment and Conservation's Website: 2008-09

Date Posted	Information Posted
April 30, 2008	Updated Chemical Drinking Water Quality Monitoring Schedule: April 1, 2008, to March 31, 2009
May 9, 2008	*Drinking Water Safety Annual Report 2007*
	Announcement: Rural Drinking Water Safety Initiative
June 10, 2008	Drinking water quality data for the Winter 2008 season
September 26, 2008	Drinking water quality data for the Spring 2008 season
January 21, 2009	Policy Directive: *Drinking Water Quality Monitoring and Reporting for Public Water Supplies*
February 5, 2009	*Hydrogeology of Western Newfoundland*
	Hydrogeological Assessment of Cold Brook, Newfoundland and Labrador
March 20, 2009	Drinking water quality data for the Fall 2008 season
March 25, 2009	*Drinking Water Safety Annual Report 2008*

Inspection and Enforcement

Permits

Under the *Water Resources Act SNL 2002 cW-4.01*, the Department of Environment and Conservation has been given the authority to issue various permits relating to different aspects of drinking water protection under the MBSAP. These include:

- Permits to Construct water and sewage works under Section 36 and 37 of the *Act*
- Permits to Operate water and sewage works under Section 38 of the *Act*
- Permits for Development Activity in a protected water supply area under Section 39 of the *Act*
- Non-Domestic Well Permits under Section 53 of the *Act*

The design and construction of all water and sewage infrastructure in the province requires an approval from the Minister for Environment and Conservation. This Permit to Construct is issued to the owner of the drinking water infrastructure and outlines standard requirements and any special conditions necessary to govern the installation of the works. The normal process is that a licensed engineer submits a design which is reviewed for compliance with the Department's *Guidelines for the Design, Construction and Operation of Water and Sewerage Systems* (see Weblink 11), and if acceptable, a permit to construct is issued. During the 2008-09 fiscal year, the Department of Environment and Conservation issued 163 Permits to Construct.

The Permit to Operate is designed to focus the awareness of municipal government leaders and operators on the basic activities required to develop and practice proactive operation and maintenance of their drinking water infrastructure. Permits to Operate are issued in four different areas: water distribution, water treatment, wastewater collection and wastewater treatment. In the 2008-09 fiscal year, the Department of Environment and Conservation issued 77 Permits to Operate.

The Department also issued 103 permits under Section 39 regulating how activities in Protected Public Water Supply Areas should be conducted so that the integrity of drinking water sources is not compromised. Nine joint permits under Section 39 and Section 48 were issued, which covers activities in or near a water body or watercourse. Permits are also required to drill or dig a non-domestic well, and must be obtained before construction begins; 23 non-domestic well permits were issued during the fiscal year for various uses including for public water supplies.

Inspection

The Department of Environment and Conservation requires that all public waterworks be maintained and operated sustainably, as prescribed by the *Water Resources Act SNL 2002 cW-4.01*. Departmental staff conduct inspections of water supply systems under construction, groundwater wells being drilled, and activities taking place in protected water supplies to ensure that they comply with the terms and conditions of their permits.

In the 2008–09 fiscal year, Departmental staff carried out a total of 163 inspections. Of these, 111 were water and sewer-related inspections of public waterworks, 30 were inspections of public groundwater supplies, and 22 were inspections of protected public surface water supplies.

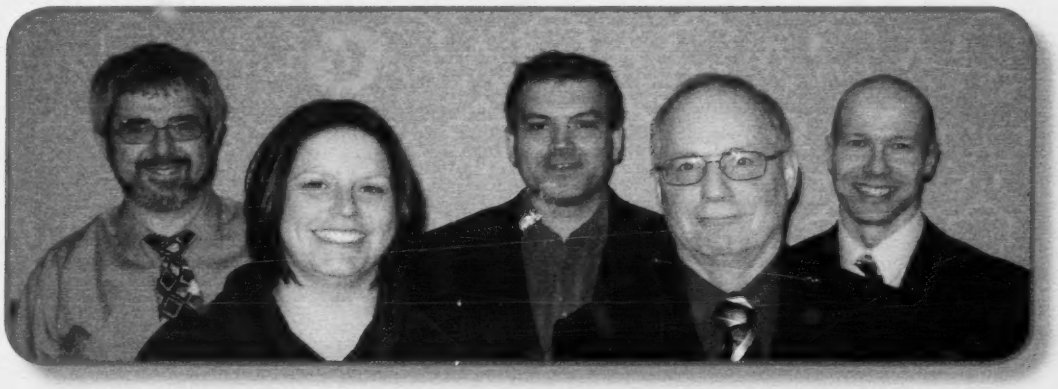
Enforcement

One of the Department's main goals is that communities achieve clean and safe drinking water in a sustainable and efficient manner. When non-compliance with the conditions of a community's permits is reported, the Department acts to enforce the regulations of the *Water Resources Act SNL 2002 cW-4.01.*

Inspection in the Beverly Lake Protected Public Water Supply Area

Operator Education, Training, and Certification

Providing opportunities to involve operators of municipal drinking water systems in ongoing training and education opportunities is an integral component of the multi-barrier approach. Recognizing this, the Department of Environment and Conservation developed a unique approach to meet the training needs of operators across the province. The Operator Education, Training and Certification (OETC) program is the first of its kind in Canada and was specifically designed to meet the needs of the province's small communities.



OETC staff (left to right): Jim Pollett, Deneen Spracklin, Darren Patey, Ervin McCurdy, Gerry Lahey

The OETC program provides operators with education and hands-on training opportunities that are focused on four key areas:

- job competency
- drinking water safety
- environmental protection
- infrastructure sustainability

Operator Education

The education component of the OETC program takes place in a classroom-type setting. Seminars are designed to provide operators with the theory and knowledge that will allow them to successfully operate their water system. Seminars are free of charge, and locations are chosen to minimize travel time and costs for participants.

The water related seminars offered through the OETC program include:

- Water Distribution Basics
- Water Distribution System Hydraulics
- Water Quality Issues
- Water Treatment Levels I and II

During the 2008–09 fiscal year, 52 operators attended three water distribution seminars in the province. The OETC Section also conducted a three-day Water Treatment Levels I and II course in Gander that was attended by 29 operators. In addition to the classroom instruction, this course included a site visit to Gander's Water Treatment Plant.

Table 12 indicates the locations and attendance of the water distribution and treatment seminars conducted during the 2008–09 fiscal year.

Table 12: Participant Numbers in the Water Distribution Seminars: 2008-09

Seminar Topic			
Water Distribution Basics	**Water Distribution System Hydraulics**	**Water Quality Issues**	**Water Treatment Levels I and II**
5 Harbour Breton	24 Corner Brook	23 Corner Brook	29 Gander

Retirement and out-migration are affecting the number of certified operators in the province. Although there were 52 operators certified for the first time in 2008–09, 30 operators retired, moved away, or took on other duties.

The need to provide operator education opportunities through the OETC Program remains strong. Communities across the province, many of which are facing challenges of operator retirement and turnover, constantly need to educate new operators. The OETC Section will continue to conduct its existing water distribution and water treatment seminars in the coming years.

Operator Certification

As this report was being prepared there were 275 certified water and/or wastewater operators in Newfoundland and Labrador. Collectively these operators hold 520 Certificates. Current certification levels include Water Distribution Operators (Class I, II, and III), Water Treatment Operators (Class I, II, III and IV), Wastewater Collection Operators (Class I and II), and Wastewater Treatment Operators (Class I and II). Certification exam results for 2008-09 are in Table 13.

The types of systems with certified operators in the province in 2008–09 include:

- 116 municipalities employing 260 certified operators
- two First Nations Communities employing five certified operators
- National Defence and the Canadian Forces (through SERCO in Happy Valley-Goose Bay) employing five certified operators
- three national parks employing nine certified operators
- two industrial/commercial systems employing five certified operators

Table 13: Certification Exam Numbers for Water System Operators: 2008–09

Certification Exam	Exams Written	Exams Passed	Percent Passing
Water Distribution Class I	18	16	89%
Water Distribution Class II	4	2	50%
Water Distribution Class III	1	1	100%
Water Treatment Class I	11	8	73%
Water Treatment Class II	11	5	45%
Water Treatment Class III	4	3	75%
Water Treatment Class IV	1	0	0%
Totals Certification Exams	50	35	70%

Operator Training Resolves BWA Issues

In the fall of 2008, a community started experiencing pressure spikes and inconsistent chlorine residuals in its water distribution system. The varied residual levels eventually led to the community being placed on a Boil Water Advisory (BWA).

The community's water distribution system operator contacted the OETC section to obtain hands-on training in both gas chlorination and control-valve operation. During the subsequent training session, the Operator Trainer explained how springs in the pilot valves regulate the larger control valves, and how both springs' range and valve size dictated which pressures and flow rates the system could regulate. The operator then recognized that the spring in the low flow by-pass was too stiff to regulate down to the pressure ranges needed, and that the larger valve could not stabilize the flows the community was using.

Through the Operator Trainer, the community's operator contacted the valve manufacturer and verified that the system could not function as it currently was. At the manufacturer's recommendation, the community made a few small alterations to the current valve, and installed new parts after a demonstration on a training valve in the Mobile Training Unit.

The operator also learned in the training session that the community's gas chlorine injector had a maximum backpressure it could inject into and that the pressure spikes were the reason for the inconsistent chlorination. Once the pressure spikes were eliminated, the chlorination system could reliably disinfect the water. Shortly thereafter the BWA was lifted.

Operator Training

Three Operator Trainers delivered 185 training sessions in the province in 2008–09 using mobile training units (MTUs). The number of repeat sessions varied from five to 24 per cent depending on the region (Table 14).

The hands-on training program will continue to evolve to meet the needs of the province's water-system operators. New equipment, new technologies, and staff turnover will require both the development of new training courses, as well as ongoing delivery of the existing curricula.

Table 14: Participant Numbers for Operator Training Sessions: 2008–09

Topic	Number of Sessions	Number of Operators Attending	Number of Communities Represented
Disinfection/Chlorination	81	128	74
Hydrant Maintenance	22	50	22
Control Valves	12	19	10
Leak Detection	22	36	20
Pipe Tapping	44	106	44
Distribution System Flushing	4	6	4
Totals	185	345	174

Annual Clean and Safe Drinking Water Workshop

The 2009 Clean and Safe Drinking Water Workshop was held from March 24 to 26 in Gander. This year's theme was "Rural Reactions and Remedies". It attracted 324 participants from across the province and country.

The presentations at this year's event were chosen to target the challenges faced by the province's small rural communities in providing clean and safe drinking water, and to offer some viable solutions to the challenges they face

One of the highlights of the workshop presentations was the session conducted by four municipal operators. Patrick Miller (Town of St. Lawrence), Albert Kendall (Town of Burnt Islands), Terry Stead (Town of Howley), and Brian Caines (Town of Buchans) discussed the use of Potable Water

Dispensing Units as an answer to the water quality problems in their communities. Copies of all presentations are available online at Weblink 12.

The 2009 workshop also offered attendees the opportunity to participate in a trade show exhibition. Sixteen companies showcased a variety of technologies and equipment related to water distribution and treatment.

2009 Operators of the Year

In 2008, the Department of Environment and Conservation presented its first "Operator of the Year" award. The Department had designed its new award program to pay tribute to municipal operators' outstanding dedication to providing clean and safe drinking water. The response to the first call for nominations was a huge success. As a result, the 2009 awards program was expanded to include two honours: Operator of the Year and Volunteer Operator of the Year.

Communities across the province were invited to nominate an operator they felt had made or was making an outstanding contribution, with details about why he or she was worthy of the award. When the deadline closed, 39 nominations had been received.

Wayne Bennett was named the 2009 Operator of the Year, based on an outstanding nomination submitted by the Towns of Daniel's Harbour, Parson's Pond, and St. Paul's. Mr. Bennett has worked as an operator since the early 1990s. Over the years he has demonstrated his dedication to providing clean and safe drinking water while facing many challenges. He is committed to participating in education and training opportunities to expand his knowledge of the water industry, and has demonstrated his professionalism by successfully attaining his Water Distribution Level II certification. Mr. Bennett remains the Regional Operator for the Towns of Daniel's Harbour, Parson's Pond, and St. Paul's, and continues to demonstrate his dedication through enthusiasm and hard work.

The "Volunteer Operator of the Year" award was created specifically to recognize individuals who operate community drinking water systems without compensation. Gerard Lee was chosen as the 2009 Volunteer Operator of the Year. His nomination was submitted by the Local Service District of Barachois Brook, where he has operated the water system for more than twenty years. Mr. Lee has attained Water Distribution Level II certification which is a rare achievement for a volunteer operator. His leadership and professionalism is an asset to his community and to its neighbours.

The Department of Municipal Affairs once again provided financial assistance to municipalities to alleviate travel costs associated with attending the workshop. Communities from the island portion of the province that were approved for the subsidy were reimbursed up to $300. Communities from Labrador that were approved for the subsidy were reimbursed up to $600.

The next Clean and Safe Drinking Water Workshop is scheduled for March 23 to 25, 2010 in Gander.

Corrective Measures

Corrective measures are a relatively new component of the MBSAP, added in the 2007-08 fiscal year. This element was added in order to focus more attention on identifying drinking water quality issues and implementing corrective measures to deal with these issues. Corrective measures can include structural, non-structural, or operational techniques and other best-management practices. There are five classes of corrective measures: policy, design, water system management, water treatment alternatives, and source alternatives.

The drive to implement corrective measures and improve the quality of drinking water in communities throughout the province has been further reinforced by the announcement of the Rural Drinking Water Safety Initiative for Newfoundland and Labrador (see information box on page 43). This Initiative is a proactive plan to implement corrective measures in rural communities facing drinking water quality issues. Table 15 describes progress made in each category of corrective measures including activities undertaken as part of the Rural Drinking Water Safety Initiative.

Activities undertaken during year one of the the Rural Drinking Water Safety Initiative included:

- the establishment of the Interdepartmental Committee on Drinking Water Safety for Small Water Systems
- the publication of the selection criteria and the guidelines for the design, construction, and operation of Potable Water Dispensing Units (PWDUs) on the Department website (Weblink 11)
- the initiation of a study of the performance evaluation of existing PWDUs
- the initiation of a study on operation and maintenance of drinking water infrastructure
- the receipt of 47 applications for funding to install PWDUs
- the awarding of a PWDU design and construction contract

Issues with THMs and HAAs in drinking water throughout the province have been documented in the Department's annual reports since the first report was published in 2001. The Department of Environment and Conservation's long-term study to identify probable causes and possible corrective measures for disinfection by-products concluded in the 2008–09 fiscal year. The study, available online at Weblink 7, provides a framework communities can use to select corrective measures to deal with disinfection by-products. This is further summarized in Figure 4.

Table 15: Corrective Measures Undertaken: 2008-09

Type of Corrective Measure	Description of Corrective Measure
Policy	► Rural Drinking Water Safety Initiative announced ► Policy Directive for Drinking Water Quality Monitoring and Reporting for Public Water Supplies ► Interdepartmental Committee on Drinking Water Safety for Small Water Systems established
Design	► Guidelines for the Design, Construction and Operation of Water and Sewage Systems updated annually ► Selection Criteria and Guidelines for the Design, Construction and Operation of Potable Water Dispensing Units ► Best Management Practices for the Control of Disinfection By-Products in Drinking Water Systems in Newfoundland and Labrador ► Study on Performance Evaluation of Existing PWDUs initiated
Water System Management	► Operator education, training and certification (see page 35) ► Regionalization of services (Roddickton-Bide Arm) ► Approximately 40 Permits to Construct issued relating to water system management (watermain upgrades, pumphouse upgrades, chlorination system upgrades, new tank, tank maintenance, pH adjustment system, water main cleaning) ► Study on the Operation and Maintenance of Drinking Water Infrastructure initiated
Water Treatment Alternatives	► One new Potable Water Dispensing Unit (Gaultois) ► Approximately six Permits to Construct issued relating to water treatment (water treatment plant upgrades, new water treatment plant, pilot water treatment systems, mixed oxidants system, PWDU upgrade) ► 47 applications for funding for the installation of PWDUs received by Municipal Affairs ► Initiation of project for the Design and Construction of PWDUs
Source Alternatives	► Approximately three Permits to Construct issued relating to water sources (intake upgrades, relocation of intake) ► Regional water system for Grand Bank and Fortune

Figure 4: Disinfection By-Product Corrective Measures

Disinfection By-Product Corrective Measures

Policy
- Policy for point of use/point of entry treatment
- Policy to promote alternative disinfectants
- Policy to promote Potable Water Dispensing Units

Source
Watershed protection

Alternative water sources:
- groundwater
- surface water sources with low DOC
- avoid shallow ponds with long exposed fetch lengths

Stop mixing groundwater with surface water

Reservoir flooding:
- avoid flooding vegetated areas
- remove vegetation before flooding
- remove submerged vegetation

Wind breaks around exposed coastal water sources with high DBPs

Relocate intake to deeper water

High quality water storage and recovery

Demand Management
Regular system flushing :
- automated flushing device or manual flushing at dead ends

Continuously bleed system at dead ends

Increase demand with new water connections

Chlorine Demand Management
Optimize disinfectant dosage if:
- Cl > 4.0 mg/L at first user
- Cl > 0.2 mg/L (regularly) at last user
- chlorine booster on system

Re-locate chlorination system:
- closer to first user
- downpipe of storage tank

Install chlorine booster at optimal location:
- if combined chlorine dose < single chlorine dose
- if chlorine > 4.0 mg/L at first user

Chlorine dose control:
- automated flow or Cl residual control
- dedicated and certified system operator

Retention Time Management
Tank location and type:
- beginning of system, elevated storage

Adjust pump schedule to:
- force turnover of water in tank
- optimize supply/demand balance
- increase velocity of inflow into tank

Reduce storage capacity:
- take tank offline
- reduce maximum water level in tank

Increase mixing in tank:
- separate inlet/outlet
- baffles
- mechanical mixing device
- avoid stratification in tank
- increase active volume in tank
- location and orientation of inlet
- smaller diameter inlet or duckbill valve
- tank aeration

Operational and Infrastructure
Optimize valve arrangement:
- minimize number of shut valves
- locate shut valves in areas of high demand

Re-routing of flows in the system through valving

Pumping to re-circulate water in the distribution system

Abandoning or downsizing mains

Clean, replace or reline:
- old pipe, cast iron pipe

Loop distribution network

Upgrade distribution system:
- reconfigure, replace, abandon pipe
- new intake

System maintenance:
- flushing, reservoir cleaning
- swabbing or pigging
- pump, flowmeter maintenance

Increase capacity of water treatment plant

Regionalization:
- regional system or regional operator

Training
- Operator education and training
- Operator certification

Point of Use
- Point of use/point of entry treatment

Treatment
Water treatment plants:
- conventional water treatment plants
- targeted removal of precursors during
- seasonal extremes (DOC in summer/fall)

Point of application of chlorine in WTP:
- use alternative pre-disinfectant
- no pre-chlorination

Filtration:
- ultrafiltration or nanofiltration
- appropriately sized and maintained

pH adjustment

Iron and manganese removal:
- oxidation and filtration

Advanced treatment for large systems:
- enhanced coagulation, reverse osmosis, granular activated carbon filtration, dissolved air floatation, ion exchange, peroxide addition

Potable Water Dispensing Units (PWDUs):
- community support

Alternative Disinfectants
- Disinfection with chloramines
- Disinfection with ozone
- Disinfection with UV
- Disinfection with mixed oxidants

Design
Improved design of water distribution and treatment systems:
- modelling
- Best Management Practices for the Control of Disinfection By-Products

Rural Drinking Water Safety Initiative

On May 9, 2008, the Honourable Charlene Johnson, Minister for Environment and Conservation, along with the Honourable Dave Denine, Minister for Municipal Affairs, announced the Rural Drinking Water Safety Initiative for Newfoundland and Labrador. The goal of this initiative is to develop a comprehensive overview of community drinking water quality issues and to implement sustainable measures to correct those issues.

The planned six-year initiative will focus on communities with populations of 500 or less during Phase 1 (first three years). In total the province has committed $20.9 million to this initiative over the first three years. A significant component of the initiative includes the installation of Potable Water Dispensing Units (PWDUs) in small rural communities. These units are small scale water treatment plants from which the residents are provided high quality drinking water. Detailed engineering studies will be undertaken during Phase 2 (last three years - funding permitting) to identify options for communities with populations over 500 people.

Level 2 of the MBSAP Highlights: 2008-09

- 18,836 bacteriological water quality samples
- 4,207 chemical and physical water quality samples
- 1,344 Quarterly and Annual Community Drinking Water Quality Reports
- 163 Permits to Construct for water supply and sewer systems
- 77 Permits to Operate for water supply and sewer systems
- 103 permits regulating activity within a Protected Water Supply Area
- 23 permits regulating non-domestic wells
- 275 certified water and/or wastewater operators work in the province
- 52 operators were certified for the first time
- 85 on-site operator training sessions

Level 3 of the MBSAP

The four components of the third level of the Multi-Barrier Strategic Action Plan are:
- legislative and policy frameworks
- public involvement and awareness
- guidelines, standards, and objectives
- research and development

This section outlines Government activities for each of these components during the 2008-09 fiscal year.

Legislative and Policy Frameworks

The legislation that governs drinking water quality in the province includes the *Water Resources Act, 2002*, the *Municipal Affairs Act, 1995*, and the *Municipalities Act, 1999*. All legislation, policy directives, standards, and regulations governing the Department of Environment and Conservation can be viewed on its website at Weblink 13.

These three *Acts* contain broadly stated initiatives. Policy directives are introduced to provide more explicit direction. In the 2008–09 fiscal year, one new policy was introduced for drinking water quality monitoring and reporting for public water supplies.

Inter-departmental Cooperation

The provincial government's efforts to ensure the safety of drinking water requires the involvement of four departments. The Departments of Environment and Conservation (acting as the lead agency), Health and Community Services, Government Services, and Municipal Affairs all have responsibilities for one or more components of the MBSAP. Their efforts are coordinated by an inter-departmental committee of Deputy Ministers, which is chaired by the Deputy Minister of the Department of Environment and Conservation.

The committee's work is supported by the inter-departmental Safe Drinking Water Technical Working Group, which was formed in June 2000. The Working Group is chaired by the Department of Environment and Conservation and includes representatives from Health and Community Services, Government Services, and Municipal Affairs. The Medical Officers of Health are also members of the Working Group, as are representatives from the Public Health Laboratory. The Working Group met six times in 2008–09. All of its activities are reported to the chair of the Steering Committee of Senior Government Officials.

The Committee and its Working Group achieved the following accomplishments and tasks in the fiscal year 2008-09:
- coordinated upgrades to the Municipal Information Management System (MIMS) in the areas of data entry for water test results, recording of Boil Water Advisories, and maintenance of current records of water-related infrastructure in the province, and kept all data up-to-date

- prepared and reviewed the *Drinking Water Safety in Newfoundland and Labrador Annual Report 2008*
- finalized proposed standards for drinking water safety for semi-public water supplies and developed an implementation plan
- reviewed provincial Boil Water Advisories and discussed ways to help communities deal with the issues that cause the advisories, and coordinated with regional water committees
- coordinated the review and update of Boil Water Advisory information provided by Environmental Health Officers
- informed committee members about the activities of the Federal-Provincial-Territorial Committee on Drinking Water and solicited comments on revised drinking water guidelines
- discussed revised Health Canada guidelines for new parameters
- reviewed the progress of a strategy for clean and safe drinking water in rural communities

New Policy Directive

A new policy directive was approved in January 2009 that establishes the Department of Environment and Conservation's drinking water quality monitoring and reporting requirements for all public water supplies. It is legislated through the *Water Resources Act, SNL 2002 cW-4.01*, Section 39. This policy addresses and supports the monitoring and reporting component of Level Two and the legislative and policy frameworks and guidelines in Level Three of the Multi-Barrier Strategic Action Plan.

Sections 1-3: Outline the objectives, context, and legislative authority for the policy.

Section 4: Provides the background on the Multi-Barrier Strategic Action Plan and which components the policy addresses.

Section 5: Provides direction on drinking water quality monitoring in Newfoundland and Labrador which includes sampling seasons, monitoring parameters, sampling frequency and monitoring protocols for the regular monitoring program. It also provides direction on performance monitoring and special monitoring procedures.

Section 6: Addresses the drinking water quality reporting procedures in Newfoundland and Labrador. The reporting procedures for exceedances, seasonal drinking water quality, and annual drinking water quality are described. The *Drinking Water Safety in Newfoundland and Labrador Annual Report* and web documents on the Department's webpage are also included.

Section 7: Lists the guidelines for drinking water quality in Newfoundland and Labrador.

The new policy directive for Drinking Water Quality Monitoring and Reporting for Public Water Supplies is an all-encompassing policy that establishes the drinking water quality monitoring and reporting requirements for all public water supplies in Newfoundland and Labrador. The policy directive is available on the Department's webpage at Weblink 13.

Public Involvement and Awareness

The Department of Environment and Conservation continues to provide easily accessible and timely drinking water quality information to the public. The Department's website is a major tool for increasing public awareness and encouraging involvement. The Department of Environment and Conservation's website is available at Weblink 14.

Watershed Management Committees are a way the public can participate in efforts to ensure clean and safe drinking water supplies. They are excellent forums in which stakeholders can voice opinions and concerns about land management and water quality issues in their watershed areas.

The annual Clean and Safe Drinking Water Workshop, which is open to all community operators and administrators, brings together drinking water quality stakeholders, government departments, consultants, suppliers, municipal operators and administrators, to learn about drinking water safety and to exchange information and experiences.

To further the Department's goal of public involvement and awareness of drinking water safety issues, employees of the Water Resources Management Division often make presentations on a range of topics to technical working groups, conferences, post-secondary education classes, municipalities, and interest groups. Presentations made in the 2008–09 fiscal year are shown in Table 16.

Jim Pollett, Water Resources Management Division, presenting at the 2009 Clean and Safe Drinking Water Workshop

Table 16: Presentations Given by Water Resources Management Division Staff: 2008-09

Conference	Presentation
Canadian Institute of Public Health Inspectors Conference in St. John's (July, 2008)	*Cross Connections and Backflow Prevention*
	Identifying Problems and Solutions for Groundwater Wells
	Pumps and Hardware for Groundwater Wells
Canadian Water and Wastewater Association (CWWA) 13th Canadian National Conference in Quebec City (October, 2008)	*Strategy for Managing DBPs in Drinking Water Systems in Newfoundland & Labrador*
Canadian Institute of Forestry Newfoundland & Labrador Section (CIF-NL) 52nd Annual General Meeting in Gander (November, 2008)	*Cross Sectoral Initiatives: Water Resources and Forestry*
Marine Institute in St. John's (March, 2009)	*Drinking Water Quality Regulatory Framework and Provincial Monitoring Program*
	The Water Quality Index
	Watershed Management and Source Water Protection in NL: Theory and Practice
8th Annual Clean and Safe Drinking Water Workshop in Gander (March, 2009)	*Best Management Practices for Controlling DBPs in NL: What Works, What Doesn't and What Could?*
	Chlorination Equipment Selection Guidelines
	Drinking Water Quality Monitoring in Newfoundland and Labrador
	Future Direction of the OETC Program
	On-site Training in Water Distribution System Flushing : Curriculum Introduction
	Newfoundland and Labrador Water Resources Portal

Guidelines, Standards, and Objectives

To ensure clean and safe drinking water, the Department of Environment and Conservation sets drinking water safety guidelines, standards, and objectives, and regularly reviews and updates them to address current issues and challenges.

In the 2008–09 fiscal year, the following drinking water safety guidelines, standards, and objectives were developed or revised:

- new haloacetic acids (HAA) Guideline for Canadian Drinking Water Quality was implemented, which greatly increased the HAA monitoring the Department performs throughout the province; the new guideline calls for a maximum allowable HAA concentration of 80 µg/L based on a locational annual running average.
- new guidelines for *Groundwater Supply and Assessment Guidelines for Subdivisions Serviced by Individual Private Wells* were created to provide information to developers and consultants regarding how to assess the quality of groundwater beneath unserviced subdivisions, and how to assess long-term drinking water quality

Research and Development

In order to stay on top of current and emerging issues that affect drinking water safety, the Department of Environment and Conservation undertakes several research and development activities each year. During the 2008–09 fiscal year these activities included:

- two year monitoring program was implemented for radiological characteristics in the province
- bromate, carbon tetrachloride and benzene were monitored in 2008-09 as emerging parameters to establish if these parameters are an issue in the province
- study on UV absorbance and UV transmittance in water distribution systems initiated
- formalized drinking water sampling QA/QC methodology
- review and update of *Municipal Affairs Master Specifications* document section pertaining to groundwater and wells.
- provincial contribution to the document *Review and Assessment of Canadian Groundwater Resources, Management, Current Research Mechanisms and Priorities*, submitted to Canadian Council of Ministers of the Environment, March 2009
- a detailed regional groundwater chemistry mapping project is currently ongoing to obtain information on groundwater chemistry, especially from the over 200 communities that rely on private wells as their source of potable water
- piloting Supervisory Control And Data Acquisition (SCADA) system access
- HAA profiling study, began in Spring 2008, with the purpose to identify the location(s) of maximum HAA concentrations
- long-term study to identify probable causes and possible corrective measures for DBPs was concluded
- pilot study was undertaken to determine the extent to which corrosion of plumbing systems in homes and public buildings affects drinking water quality in the province

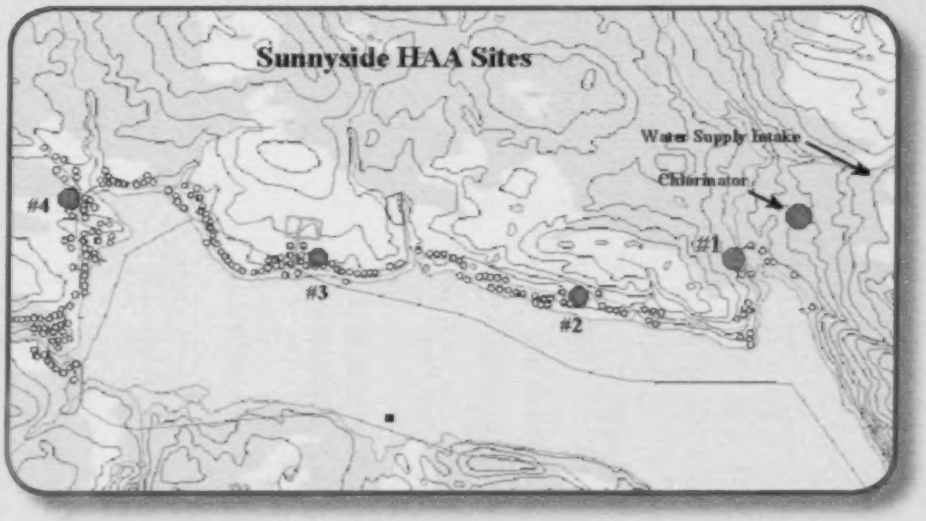
- study was undertaken to determine what impact, if any, new private developments in Cold Brook will have on the Town of Stephenville's water supply
- study on the availability of water supplies in 17 agricultural development areas in the province was undertaken

HAA Profiling Study

A new guideline for safe levels of haloacetic acids (HAAs) in drinking water was established by Health Canada in March 2008. The guideline is 80 µg/L based on a locational annual running average of a minimum sampling schedule of four times a year.

The guideline also specifies that samples should be taken from the point of maximum HAA concentration. To determine these locations, the Department of Environment and Conservation developed a profiling study to be conducted over a two to three-year period.

The profiling study began in spring 2008. Twelve communities that have a number of system types such as linear and branched, and infrastructure types such as storage tanks and chlorine boosters, were selected for the study. Testing for HAAs was conducted at four different locations along each community's water distribution system. The results of the study will enable the Department to determine the point of maximum HAA concentrations in the public water distribution systems in Newfoundland and Labrador.



HAA profiling locations in Sunnyside

Corrosion Control Study

The Department of Environment and Conservation piloted a study in January 2009 to determine if corrosion is a problem in the province's public water supplies. The key objective of the study was to determine the extent to which corrosion may affect plumbing systems in homes and public buildings. A total of 352 samples were taken throughout the province as part of the study.

The study was also designed to help determine the feasibility of specialized lead monitoring procedures that could measure the corrosive potential of municipal water supplies that could replace the standard lead monitoring procedures. Public water supplies in the province are routinely tested for pH, lead, and all other metals. In the study, lead was used as the indicator of corrosion, and the sampling procedures focused only on lead concentrations.

Based on the study's findings, the Department has concluded that corrosion is not a major issue in most Newfoundland and Labrador water supplies. Key findings show that only three per cent of samples taken were above the recommended guidelines for lead. All communities who participated in the pilot study were notified as soon as the results were available.

Based on the review of available information, lead soldering and older brass faucets and fixtures in residential homes may be the probable cause of elevated levels of lead in some residences. In order to avoid any exposure to elevated lead concentrations, residents are advised to flush their lines before drinking water. If there are additional concerns, a filter approved by the National Sanitation Foundation (NSF) can be used to remove any lead that may be in the water lines.

The study, *Pilot Study to Develop Action Plan on Indicators for Monitoring Corrosion Control in Drinking Water*, is available on the Department's website at Weblink 15.

Level 3 of the MBSAP Highlights: 2008-09

- six meetings of the Safe Drinking Water Technical Working Group were held
- several studies were conducted related to drinking water quality topics and issues
- 14 presentations were given by staff on drinking water topics and issues
- one new drinking water quality guideline was implemented: haloacetic acids (HAAs)
- research and development initiatives were continued with special parameter monitoring

The Path Forward, Government Action Plans: 2009–10

Department of Environment and Conservation

The Department of Environment and Conservation will continue to pursue its commitment to develop and strengthen all levels and components of the Multi-Barrier Strategic Action Plan (MBSAP) in order to improve its Drinking Water Safety Program.

The Department's drinking water monitoring activities in the 2009–10 fiscal year will be consistent with those of the previous year. There are 3,991 drinking water quality samples scheduled for collection and analysis. This total includes:

- 359 source water samples, which will be analyzed for inorganic chemical parameters
- 1,062 tap water samples, which will be analyzed for inorganic chemical parameters
- 1,226 tap water samples, which will be analyzed for trihalomethanes (THMs)
- 1,344 tap water samples, which will be analyzed for haloacetic acids (HAAs)

Quality Assurance/Quality Control (QA/QC) sampling will continue as part of the monitoring program. Drinking water quality issues of priority concern for 2009–10 are expected to be:

- the formation behaviour and location profiling of haloacetic acids (HAAs)
- contaminant parameters (particularly arsenic, lead, barium, and turbidity)
- special sampling for radiological characteristics
- special sampling for emerging parameters

The MBSAP will be further strengthened by departmental activities relating to permits to operate, which promote the proactive maintenance and operation of water supply systems.

The Department will also continue to provide education and hands-on training opportunities to water system operators. The current curriculum will be offered on an as-needed basis for new operators or operators preparing to write certification exams. The program will introduce new education and training initiatives during the 2009–10 fiscal year, including an education session designed to help communities understand their quarterly and annual Drinking Water Quality Reports. In addition, a seminar for operators on the proper handling of chlorine will be offered. On-site training in water distribution system flushing will continue throughout the province during the 2009–10 fiscal year.

Planning and preparation is already underway for next year's Clean and Safe Drinking Water Workshop, which is scheduled for March 23 to 25, 2010 in Gander. The next workshop will assist operators in addressing water system issues that are faced by small communities.

In May 2008 the provincial government announced its Rural Drinking Water Safety Initiative. Subject to the availability of funding, year two of the Initiative will see the commissioning of the first round of PWDUs, a call for applications for the second round of PWDU funding, and the initiation of feasibility studies of possible corrective measures for communities with populations greater than 500 that have drinking water quality issues.

Department of Municipal Affairs

The Department of Municipal Affairs will continue to financially support community requests for water-related infrastructure. It has allocated $18 million over the period 2008-11 for this purpose under the Province's Rural Drinking Water Safety Initiative. A priority for capital funding assistance will continue to be water treatment technology that will enable communities to meet the *Guidelines for Canadian Drinking Water Quality.*

Based on a comprehensive evaluation of every public water supply in the province, the Initiative outlines several options for improving drinking water safety. The installation of Potable Water Dispensing Units is a major part of the identified solutions. These units are small-scale water treatment plants that provide residents of small communities with drinking water that meets the *Guidelines for Canadian Drinking Water Quality.*

The Department of Municipal Affairs will encourage cost-effective approaches to regionalizing operational and maintenance services by offering both advisory and financial support. It will also continue to provide financial assistance to communities so that they can send representatives to training, workshop and certification courses related to drinking water safety.

The Department is also encouraging communities to avail of the benefits of the regionalization services initiative of the government.

Department of Government Services

Through its bacteriological water monitoring program, the Department of Government Services (GSC) helps ensure that public drinking water is protected from waterborne diseases and is safe for consumption. Government Services collected 18,836 public bacteriological water samples in 2008–09. This ongoing high level of public water sample collection is an indication of the Department's commitment to a satisfactory level of bacteriological water monitoring and compliance with levels recommended in the Province's standards and the *Guidelines for Canadian Drinking Water Quality.*

A review of the current sampling program was undertaken as part of GSC's workload analysis in the 2006–07 fiscal year. One of the purposes of the review was to determine whether additional improvements or efficiencies could be achieved. The review resulted in the Budget 2007 announcement of six new Environmental Health Technician positions. In 2008–09, the new staff members were placed in GSC offices throughout the province. Part of their assigned duties is to assist the Department's Environmental Health Officers to collect water samples, further securing the safety of the province's public water supplies.

The Department is also interested in improving the surveillance of drinking water that is accessible to the public through means other than municipal/public water supplies, such as via semi-public and institutional supplies. It will continue discussions with the Department of Environment and Conservation on this issue.

As in the past, the Department of Government Services will also continue to partner with the Department of Health and Community Services and the Regional Health Authorities. It is important to ensure that Environmental Health Officers can access the highest standard of professional development in their field, particularly in bacteriological water monitoring. Consequently, support for professional development in this area will continue, in cooperation with the Canadian Institute of Public Health Inspectors (Newfoundland and Labrador branch).

The summer of 2008 provided an opportunity for all Environmental Health Officers and Trainees in the province to participate in the Canadian Institute of Public Health Inspectors National Educational Conference, held in St. John's in July. In addition, Government Services' environmental health professionals were provided with a one-day Water Workshop immediately following the conference. The Department recognizes that continuous learning is necessary to build capabilities and to ensure that its environmental health personnel have the best possible tools and information at their disposal.

Department of Health and Community Services

Through the Provincial Public Health Laboratory and regional testing locations, water samples from municipal and private supplies are tested for E. coli and total coliform bacteria. In 2008–09, the Department of Health and Community Services continued to support and fund this bacteriological water quality monitoring and testing program.

In 2009–10 the Department of Health and Community Services and the four Regional Health Authorities will continue their ongoing drinking water safety initiatives by working collaboratively with provincial and municipal partners to enhance health protection efforts and disease prevention initiatives that are related to drinking water quality. They will continue to:

- provide policy and technical support to Environmental Health Officers who perform bacteriological water quality monitoring and interpret bacteriological water quality test results
- review and enhance drinking water safety promotional materials, where necessary
- provide health-related advice to municipal leaders and residents where unsatisfactory water quality in public water supplies has been identified
- partner with the Department of Government Services and the Canadian Institute of Public Health Inspectors (Newfoundland and Labrador branch) to provide Public Health Inspectors with continuing professional development that is related to drinking water quality
- work on the national and inter-provincial levels on safe drinking water initiatives such as the Federal-Provincial Committee on Health and the Environment